A CULTURAL, COMMUNITY-BASED APPROACH TO HEALTH TECHNOLOGY DESIGN

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LIST OF ABBREVIATIONS

CSCW	Computer-Supported Cooperative Work
HC	Horizontal Collectivist
HCI	Human Computer Interaction
HV/IC Framework	Horizontal-Vertical Individualism-Collectivism Framework
HI	Horizontal Individualist
ICTs	Information and Communication Technologies
LHA	Lay Health Advisor
TTM	Transtheoretical Model
Ubicomp	Ubiquitous Computing
U.S.	United States
VC	Vertical Collectivist
VI	Vertical Individualist

SUMMARY

This research has examined how Information and Communication Technologies (ICTs) can promote healthy eating habits amongst African Americans in low-income neighborhoods, a population that faces disproportionately high rates of diet-related health problems. In this dissertation, I describe the formative research I conducted to obtain system design guidelines and how I used those guidelines to develop two applications: EatWell and Community Mosaic. I also describe the results of the in-depth field studies I conducted to evaluate each application. Both EatWell and Community Mosaic incorporate the cultural construct of collectivism, a social orientation in which interdependence and communal responsibility are valued over individual goals and independence. As researchers have generally characterized the African American culture as collectivistic and argued for the value of designing collectivistic health interventions for this population, I examined the implications of taking such an approach to designing health promotion technologies. EatWell and Community Mosaic are collectivistic because they empower users to care for the health of their local community by helping others learn practical, locally-relevant healthy eating strategies.

I discuss the results of my formative fieldwork and system evaluations, which characterize the value, challenge and nuances of developing community-based health information sharing systems for specific cultural contexts. By focusing on health disparities issues and the community social unit, I extend previous health technology research within Human-Computer Interaction (HCI). In particular, my results describe 1) a set of characteristics that help make shared material useful and engaging, 2) how accessing this information affects how people view the feasibility of eating well in their local context, 3) the way in which sharing information actually benefits the contributor by catalyzing personal behavior reflection, analysis and modification and 4) how sharing information and seeing that information's impact on others can help to build individuals' capacity to be a community health advocate. In addition, my work shows how examining cultural generalizations such as collectivism is not a straightforward process but one that requires careful investigation and appreciation for the way in which such generalizations

are (or are not) manifested in the lives of individual people. I further contribute to HCI by presenting a set of important considerations that researchers should make when designing and evaluating community-based health systems. I conclude this dissertation by outlining directions for future HCI research that incorporates an understanding of the relationship between culture and health and that attempts to address health disparities in the developed world.

CHAPTER 1

INTRODUCTION

Health is becoming a key area of inquiry within the Human-Computer Interaction (HCI) community as researchers have shown the potential of technology to help people achieve personal wellness, manage diseases and engage in preventative behaviors. For example, researchers have developed systems to help the elderly live independently and healthfully longer (Dishman 2004; Mynatt 2001) and applications that help the general population improve their physical fitness (Consolvo 2006; Lin 2006; Maitland 2006; Toscos 2008), manage chronic diseases (Mamykina et al. 2008; Preuveneers and Berbers 2008) and eat more nutritiously (Chang 2006; Chi et al. 2007; Mankoff 2002). These systems have focused on individual users as well as social groups such as friends, coworkers and family members, though the community is one social unit that has rarely been examined within the health technology domain (Chiu et al. 2009; Consolvo et al. 2008a; Kimani et al. ; Maitland 2006).

There has also been very little focus within HCI on the way in which ethnic culture[1] influences areas of health such as nutrition, and the implications that this has for technology design. Yet, medical researchers in the United States (U.S.) consistently argue that when trying to address nutrition, particularly in ethnic groups that experience disproportionate health problems, it is critical to account for individuals' cultural background (Campbell 1999; Kreuter and McClure 2004). Indeed, taking into account culture can enhance the effectiveness of interventions because eating and nutrition practices are inextricably tied to aspects of culture such as the concerns, needs, interests, traditions and history of a group of people (Campbell 1999; Karanja 2002; Kreuter et al.

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[1] In this dissertation, I use the following definition of culture: "Culture is learned, shared, transmitted inter-generationally, and reflected in a group's values, beliefs, norms of communication, familial roles, and other social regularities." (Kreuter and McClure 2004). Furthermore, unless otherwise noted, when referring to culture, I will mean *ethnic culture*, that is, the values and norms that broadly characterize an ethnic group.

2003). However, while many culturally targeted approaches in the medical community have resulted in non-technological interventions (*e.g.,* church-based educational campaigns), few have examined the potential benefits that technology may afford. Thus, there exists an exciting opportunity within HCI research to explore how technologies that promote healthy eating practices can be designed to account for cultural influences on health.

In my dissertation research, I have addressed the gap between HCI research showing the promise of technological approaches to health promotion and medical research showing the importance of accounting for culture in health interventions. I focused on nutrition within a particular socioeconomic, geographic and cultural context: African Americans in low-income Southern U.S. communities. African Americans are an important group to study because they experience a disproportionate amount of diet-related health problems such as diabetes and obesity (Flegal et al. 2010; Palmer et al. 2008). Furthermore, individuals in low-income communities typically face increased healthy eating challenges, for example, because healthy foods are simply hard to find (Morland et al. 2002). In addition, communities in the Southern U.S. experience some of the highest rates of diet-related disease[2].

The guiding argument of my dissertation work is that when designing technology to promote healthy living it is critical to account for the way in which culture shapes health behaviors and attitudes, particularly when addressing health disparities. The overall goal of my research was to unpack this argument by providing two case studies that show how the HCI community can use an understanding of the relationship between culture and health to design applications that promote healthy eating amongst groups such as African Americans. To this end, my dissertation research focused on designing two systems that incorporate the cultural construct of *collectivism* and understanding how these applications impact the health and attitudes of system users. Collectivism is a perspective in which caring for the group is valued more than caring simply for the individual. A collectivistic social orientation is characterized by a sense of communal

[2] http://www.cdc.gov/obesity/data/trends.html, http://www.cdc.gov/obesity/data/trends.html#Race

responsibility, interdependence, cooperation and collective survival (Black et al. 2005; Chesla et al. 2004; Kreuter et al. 2003). Researchers have characterized the African American culture as collectivist and argue that understanding how this cultural construct shapes health attitudes and behaviors is important (Kreuter and Haughton 2006; Kreuter and McClure 2004).

While describing the African American culture as collectivistic represents a broad generalization, it does provide a starting point from which to explore relevant values in the design of health interventions. (Indeed, through my dissertation work I show how such a characterization turns out to not be quite so straightforward and that much future work in this area is needed.) Within health promotion research, one class of collectivism-focused interventions has focused on developing *lay health advisors* (LHAs), people who are empowered to take responsibility for improving the health of their community. In these interventions, researchers train trusted community residents to advise and support other community members in making healthy lifestyle choices (Baffour, Jones and Contreras 2006; Plescia, Groblewski and Chavis 2008). This intervention model has been particularly useful in addressing health disparities; indeed, it was first advocated by the Federal Government as a means of reaching underserved populations (Auger and Verbiest 2007).

Through qualitative fieldwork (Chapters 3 and 5), I derived design implications for translating the cultural construct of collectivism into concrete software systems. These systems, EatWell and Community Mosaic, incorporate the driving principle of LHA interventions. In particular, each system helps users take an active role in promoting healthy eating habits in their local communities by allowing them to share their commentary (thoughts, experiences and opinions) on eating healthfully with one another. The first system that I developed is EatWell (Chapter 4), which lets people use their cell phones to record audio clips describing their how they have tried to eat healthfully in their local community. These clips are then shared with others in the community with the hope that they will gain useful ideas to try out themselves. The second system, Community Mosaic (Chapter 5), leverages the cell phone and interactive public display platforms to help people share their healthy eating ideas visually. Through the design,

implementation and evaluation of these systems, I explored the implications of designing culturally focused health applications that incorporate the concept of collectivism.

1.1 Research Questions

The following overarching question has guided my dissertation work: *How can the cultural construct of collectivism be incorporated into the design of nutrition-focused technologies for low-income African American communities, and what are the implications of doing so?* My thesis statement is: *The cultural construct of collectivism can be translated into software systems by designing applications that support people in sharing health commentary (thoughts, experiences, and opinions) with members of their local communities. These applications reflect a collectivist orientation because they help people care for the health of the community by sharing their personal strategies for eating healthfully as well as the community resources and barriers that exist. People's interest in accessing this commentary will be affected by specific characteristics of the content itself. In addition, accessing this content will affect how people conceive of the state of health in their communities. Finally, sharing information in these systems will affect people's perception of the extent to which they can and are helping to improve the health of their community.*

In the first phase of my research, I conducted formative fieldwork to examine with what aspect of nutrition participants were most interested in receiving support (Chapter 2). My results showed that they were most excited about learning more about healthy eating. Based upon these results and my goal of exploring the impact of collectivistic health applications, I designed two systems that help people in create and share commentary about nutrition with others in their local communities. By providing a platform on which community members can discuss nutrition, my applications embody the notion of collectivism because they help people take an active role in improving the health of the community. In particular, the designs help people to share with others

1) their personal strategies for, and experiences with, eating healthfully and
2) information about community resources for eating healthfully

Through my research, I examined how people are affected by *sharing* their nutrition-related thoughts and ideas and by *accessing* the commentary of others. In

particular, I examined three implications of this strategy to designing collectivism-focused health technology:

1) *what factors keep people engaged* with information that is shared,
2) how accessing this information *affects their perceptions of their community* and
3) how sharing this information affects their *confidence that they can and are improving the health of their community*.

Below I describe the specific research questions that I examined in my thesis work.

RQ1: With what aspects of nutrition are individuals in low-income African American communities most interested in receiving support and what socio-cultural considerations should be made when providing this type of support? Answering this initial research question helped me identify with what aspect of nutrition people were personally interested in receiving support (*e.g.,* dietary monitoring or learning about health) as well as participants' views regarding how their community could be best supported in coming together to promote healthy eating (Chapter 3 and 5). In addition, I identified particular aspects of the socio-cultural environment (low-income African American neighborhoods in Southwest Atlanta) that I should take into account when designing nutrition-oriented applications. These findings provided me with guidelines for designing my two applications.

RQ2: What factors lead people to feel engaged with commentary (thoughts, experiences, and opinions) that community members share about eating healthfully? By answering RQ1, I concluded that a promising design direction would be to support community members in sharing commentary about trying to eat healthfully in their local neighborhoods. With RQ2, then, I examined what factors make this commentary engaging and interesting to people (Chapters 4 and 6). Answering this question was important because people may be more likely to access this content if they find it to be interesting.

RQ3: In what ways does accessing the nutrition-related commentary of local community members affect how people conceive of the state of health in their community? RQ3.a: Does using these systems improve or worsen their perception of the community's ability to eat healthfully, given the environmental and cultural

constraints and affordances? RQ3.b: Do they feel an increased understanding of the nutrition-related issues and resources that exist within their community? RQ3 helped me understand how the way in which people think about their community is affected by the health-related comments of those in their local communities. In my study of Community Mosaic, I answered RQ3a by examining 1) to what extent using the system improved participants' perceptions of their ability to eat healthfully in their community and 2) how well they thought Community Mosaic addressed the community's healthy eating challenges (Chapter 6). To answer RQ3b, I examined to what extent participants felt that they learned new healthy eating ideas from Community Mosaic (Chapter 6). In the formative focus groups that I conducted prior to designing Community Mosaic (Chapter 5), I found that participants were strongly against a system that focuses on specifically discussing the challenges to healthy eating in the community – they wanted to focus on the sharing of positive experiences. As such, Community Mosaic was designed to facilitate the sharing of positive experiences and hence in RQ3b, I focused on how well participants improved their knowledge of local healthy eating ideas (as opposed to the issues).

RQ4: Do people feel that they can and are improving the state of health in their community by sharing their thoughts on nutrition? One benefit of helping people take on the role of an LHA is that they feel that they are improving the health of the community (Auger and Verbiest 2007). With RQ4, I studied how health applications can similarly help people feel that they can and are improving the health of their community. In my study of EatWell, I found that people were excited to see that people were working together to collectively improve the health of the community. However my participants talked about this improvement in terms of what *other* people in the system were doing. In my study of Community Mosaic, I used RQ4 to examine how a technology can help individuals feel that *they themselves can improve* and *are improving* the state of health in the community (Chapter 6).

1.2 Overview of Dissertation

The remainder of this dissertation is organized as follows. In Chapter 2, I describe related work, including research on African American health disparities, the relationship

between culture and health, culturally focused health interventions and technological approaches to health promotion.

In Chapter 3, I describe the formative qualitative fieldwork I did to obtain design guidelines for health technology focused on African Americans in low-income neighborhoods in Southwest Atlanta, GA, USA (RQ1). Using focus groups and participatory design sessions, I examined participants' preferences for future health systems. I also examined their existing nutrition-related practices and attitudes to gain a deeper appreciation for the socio-cultural context in which a technology that I designed would be deployed. This fieldwork yielded three important findings that helped ground my subsequent design efforts.

Based on my fieldwork, I designed EatWell, an application that allows people to use their cell phones to record and share audio stories about how they have tried to eat healthfully in their neighborhoods. Chapter 4 describes the design of EatWell and the field study I conducted to evaluate this system. Through this study, I identified three explanations for why participants were engaged with the content shared in EatWell (RQ2). EatWell not only surfaced interesting findings, but also helped me identify research questions that I explored further with my second system, Community Mosaic.

In Chapter 5, I describe my process of designing Community Mosaic (CM), a system that helps members of my target population share their thoughts about trying to eat healthfully with one another. In particular, I discuss the formative focus groups I conducted to obtain feedback from YMCA members. My findings reveal what they felt would be the most and least effective ways of technologically helping residents encourage healthy eating in the community (RQ1). Based upon the feedback in these sessions, I derived design guidelines for CM and accordingly refined my initial design concept. In this chapter I also overview the iterative design process I engaged in, soliciting feedback on the design from HCI experts and running a pilot study to further refine the design.

CM allows people to use their existing cell phones to send photos and text documenting their experiences with trying to eat nutritious foods in their daily lives. This content is then visualized on an interactive touch screen display application. My goal was that by sharing these experiences, CM users will give others useful ideas for how to eat

healthfully in their community and encourage them to eat better. In Chapter 6, I describe the field trial that I conducted to evaluate how members and staff of the YMCA used CM. My field trial consisted of interviews, focus groups, surveys, a content analysis of system messages, and an analysis of system logs. Together, my results show how CM functioned as a tool for building the community's capacity to eat healthfully. For example, I discuss what participants felt were the benefits and drawbacks to promoting wellness by using SMS and MMS (and subsequently text and photos) to document and share healthy eating ideas (RQ2). I also describe how CM helped to specifically meet the needs of the community as described by participants (RQ3a) and to what extent they were able to gain useful healthy eating ideas from the system (RQ3b). In addition, I discuss how using CM affected participants' attitudes regarding their personal capacity to encourage others to eat well (RQ4).

In Chapter 7 I synthesize all of my findings and reflect upon important considerations that should be made when designing and evaluating community-based health information systems. This discussion can help guide future work by giving researchers a sensitizing lens with which to start the design process and a set of questions to investigate when evaluating such community-based health applications. In my discussion I provide a number of suggestions for future work.

Finally, in Chapter 8 I conclude by reflecting upon two themes that underscore my dissertation research more broadly. First, I discuss previous research on culture in HCI and the value of studying cultural issues in HCI health research. Second, I reflect upon previous HCI research on health disparities in the developing world and argue for the importance of a similarly focused research agenda that explores how technology can address health disparities in the developed world. In discussing each of these topics, I present suggestions for future work.

1.3 Contributions

My work contributes to the HCI community in the following ways. First, through the design and evaluation of two applications, I provide a set of case studies detailing how technology can address health disparities in developed nations such as the United States – and the criticality of this type of research agenda. Second, through these case

studies I characterize the process and benefit of incorporating an understanding of the relationship between culture and wellness into health systems. I further show how these systems can impact health-related knowledge, behaviors and attitudes. Third, while previous HCI health research has examined the ramifications of applications for individuals and social groups such as friends and family, my research builds upon previous work by presenting the construct of collectivism as a design orientation for health systems. Furthermore, I articulate how such systems can help people care for the health of their local community. Finally, based upon my research, I present a set of recommendations for the future design and evaluation of community-based health information systems.

CHAPTER 2

RELATED WORK

My dissertation research is primarily informed by work on health technology within HCI, Computer-Supported Cooperative Work (CSCW) and Ubiquitous Computing (Ubicomp). In addition, my focus on African American health disparities, collectivism and the LHA model is informed by research within the public health and medical domains. In this section I begin by providing an overview of African American health disparities. I then describe the relationship between culture and health, discussing the individualism-collectivism framework and the LHA model, two concepts that have strongly influenced my work. Next, I provide an overview of technological approaches to health promotion amongst lay people by describing monitoring tools that provide support for reflection and expert feedback, social health applications and online health communities. The work that I describe below provides motivation and context for the importance and contribution of my dissertation research.

2.1 African American Health Disparities

The medical community has clearly shown that some health problems affect ethnic minorities in the United States (such as African Americans[3] and Hispanic Americans) with greater prevalence than the rest of the population. For example, African Americans are disproportionately affected by diet-related health problems such as diabetes, hypertension, stroke, heart disease and obesity (Chesla et al. 2004; Horowitz 2004; Karanja 2002). As compared to Caucasians, African Americans are 40% more likely to be hypertensive, but 10% less likely to be adequately managing their high blood pressure[4]. Similarly, African Americans are 40% more likely to be obese than Caucasians

[3] In this dissertation, I use the terms "Black", "Black American" and "African American" interchangeably to refer to individuals living in the United States who self-identify as being of African descent.
[4] http://www.omhrc.gov/templates/content.aspx?ID=3018

(Black women are 70% more likely) and almost two times as likely to have diabetes[4,5]. Black Americans die from cardiovascular disease 30% more than Caucasians[5]. Individuals living in low-income communities may face even greater challenges because poor neighborhoods are much less likely to have supermarkets than affluent neighborhoods and these numbers are further exacerbated when looking at poor African American neighborhoods (Morland et al. 2002). In addition, stores in lower-income neighborhoods are less likely to stock healthy foods such as fruits, vegetables, low-fat milk and snacks (Horowitz et al. 2004). For example, one study found that higher-income neighborhoods in Los Angeles had about twice the variety of fruits and vegetables than stores in the lower income neighborhoods (Sloane et al. 2003b).

Thus, health sciences research has overwhelmingly shown that the African American community is facing a serious health crisis, as rates of many serious diet-related heath problems remain significantly higher in this group than in other segments of the population. Because of these issues, medical and public health researchers have advocated for a directed research agenda that seeks to eliminate these health disparities (Ahye, Devine and Odoms-Young 2006; Karanja 2002; Kreuter et al. 2003). Indeed, this crisis has become a part of the national health agenda as the National Institutes of Health and the U.S. Department of Health and Human Services, for example, have created specific offices whose goal is to find ways to eliminate the health disparities that exist within minority populations such as the African American community[6].

Health researchers have conducted a number of studies to understand how to shape research efforts that address health disparities. They have overwhelmingly come to the conclusion that to eliminate health disparities, interventions must go beyond understanding the role of genetics and biology (Plowden and Thompson 2002). Instead, interventions must be sensitive to the ways in which culture affects health behaviors and attitudes (Airhihenbuwa 1996; Campbell 1999; Horowitz 2004; Kreuter and McClure 2004).

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[5] http://www.cdc.gov/nccdphp/publications/aag/reach.htm

[6] The National Center on Minority Health and Health Disparities (www.nimhd.nih.gov/) and The Office of Minority Health (www.minorityhealth.hhs.gov/)

2.2 The Affects of Culture on Health

2.2.1 Defining Culture

Researchers argue that accounting for culture may increase the effectiveness of health interventions (Campbell 1999; Karanja 2002; Kreuter et al. 2003). Indeed, failing to do so can lead to interventions that cause people to feel socially isolated, for example, if the recommendations naively force them to shun their cultural traditions (Airhihenbuwa 1996; Horowitz 2004). Horowitz *et al.* (Horowitz 2004) found that the participants in their focus groups (low-income African Americans and Latinos with hypertension) understood that certain eating habits contributed to their disease but felt that physician recommendations were difficult to follow within their specific cultural context. They further found suggestions proposed by health professionals to be isolating because they required them to be removed from practices common in their culture. The researchers concluded that dietary counseling should be improved such that it directly addresses the cultural barriers to maintaining healthy eating habits. They suggest doing this by developing dietary recommendations that reflect an understanding of the "cultural, economic, and social realities of [individuals]" (Horowitz 2004).

As is true in a number of disciplines that concern themselves with the study of culture, public health research has often examined the relationship of culture to health without a clear or well-agreed upon definition (Kreuter and McClure 2004). Kreuter & McClure (Kreuter and McClure 2004), who have conducted extensive research on health disparities in the African American community, offer the following definition:

> "Culture is learned, shared, transmitted inter-generationally, and reflected in a group's values, beliefs, norms of communication, familial roles, and other social regularities." (Kreuter and McClure 2004).

While many other definitions of culture exist, I have chosen to use this definition to guide my research as it touches upon key features of ethnic culture that I focus upon (particularly values, beliefs and practices). Kreuter & McClure discuss four ways in which health communication interventions can be made culturally sensitive (Kreuter and McClure 2004). The most fundamental way to tailor communication is by taking a *linguistic approach*, that is, providing messages in the culture's dominant language (*e.g.,* Spanish for a Mexican population). One could also take a *peripheral approach*, in which

the packaging of message contents is made relevant to a particular culture. A peripheral approach would focus on using relevant fonts, colors, and images. In contrast to a peripheral approach, an *evidential approach* focuses not on the packaging but rather on adapting the message content such that it shows people that certain health issues are particularly prevalent and important to manage in certain cultural groups. Such an approach might, for example, attempt to convince individuals of the disproportionate rates of diabetes amongst African Americans and increase their perceived vulnerability to the disease (in hopes that they will then engage in preventative measures). Finally, in a *socio-cultural* approach, the intervention is tailored such that the "cultural values, beliefs, and behaviors are recognized, reinforced, and built upon to provide context and meaning to information and messages about health" (Kreuter and McClure 2004). Many health researchers have successfully taken this final approach, and thus, it is the one that I have chosen to explore in my research. In the next section I discuss some of the socio-cultural influences on health to further explain the importance of developing health interventions that account for these factors.

2.2.2 Socio-cultural Influences on Dietary Practices & Attitudes

There are numerous ways in which researchers have shown that that culture directly and indirectly shapes eating practices. For example, it is important to understand the historical significance of food, both in terms of the nature and origin of African American food practices, and the reasons why it may be difficult to modify current eating habits. Researchers have noted that many African Americans feel current food practices have been shaped by the impact of slavery on their ancestors' diet (Airhihenbuwa 1996; Horowitz 2004; James 2004). James describes the historical influence on African American food practices like this (James 2004):

> "Slaves who were brought to the USA combined their West African cooking methods with British, Spanish, and Native American (American Indian) techniques with whatever foods were available to produce a distinctive African American cuisine called 'soul food'… Soul food emphasizes fried, roasted, and boiled food dishes using primarily chicken, pork, pork fat, organ meats, sweet potatoes, corn, and green leafy vegetables." (p. 351)

James notes that traditional African American dishes are referred to as *soul food* because "the foods of the ancestors nourish the body, nurture the spirit, and comfort the soul." Examples of soul food dishes include fried chicken, chitterlings, barbecued proteins,

macaroni and cheese, collard greens, cornbread, cobblers, and fruit pies (Airhihenbuwa 1996; James 2004). These dishes are often high in fat and calories.

Despite the nutritional challenges that they may present, cultural foods often hold significant value for people. As such, changing one's eating habits can be particularly challenging if one feels that he or she has to give up traditional cultural foods. For example, James found that her study participants felt eating healthfully meant they had to conform to the dominant culture, thereby giving up some of their own cultural heritage (James 2004). They not only wanted to partake of these foods themselves, but also wanted to pass them down to their children. Indeed, cultural foods are hard to let go of: they are one of the last traditions that people hang onto when assimilating into a new culture (Kittler and Sucher 2001). As such, food can act as a means of preserving traditions and maintaining group (*e.g.,* cultural) identity (James 2004). Thus, researchers have to consider that while unhealthy cultural foods may be detrimental to one's health, interventions that ask individuals to give them up completely may face significant opposition.

In addition to the historical significance of foods, the cultural creation of the ideal body image is important to consider as well (Dannelly et al. 2005). For example, Walcott-McQuigg *et al.* (Walcott-McQuigg et al. 1995) found that the African American women they studied did not equate being slim with being attractive and often did not define being overweight as unhealthy. While it cannot be generalized that all African Americans share this opinion, there is evidence that shows that overall, cultures (and subcultures) differ in the body shape ideals that they create, making this one of the many aspects of culture that it is useful to examine in health interventions.

In summary, some of the many ways in which cultural values shape eating practices include the development of a culturally distinct set of foods, a group's desire to preserve these cultural foods and the cultural shaping of the ideal body image (Ahye, Devine and Odoms-Young 2006; James 2004; Kreuter and Haughton 2006; Kreuter and McClure 2004).

2.2.3 The Individualism-Collectivism Framework

The relationship between eating and culture is complex and multi-faceted. In my research I have chosen to focus on one particular aspect of African American culture – the concept of collectivism. Numerous researchers have studied the extent to which different cultures are collectivist versus individualist. These two classifications help characterize a culture's perspective on the value of an individual versus collective pursuit of wellbeing. Individualistic cultures prioritize personal goals and achievement and prefer independence and resisting pressure to conform to group norms (Nelson and Shavitt 2002). In contrast, collectivist cultures believe that the basic unit of society is the group (not the individual) and value social norms, group-oriented achievement goals and seek to fulfill the needs and expectations of family, friends and the larger community (Komarraju and Cokley 2008; Nelson and Shavitt 2002). Collectivist cultures are distinguished by the way in which they value communal responsibility, interdependence, cooperation, collective survival and cultural traditions (Black et al. 2005; Chesla et al. 2004; Kreuter et al. 2003). Thus, one major hallmark of collectivist cultures is the collective pursuit of group success, and in the context of health, the pursuit of group wellbeing.

Yet, understanding the manifestation of collectivism within a culture requires more than a binary classification of individuals as individualist or collectivist. Within the individualism-collectivism continuum people can be characterized as horizontal or vertical thereby yielding four possible classifications: horizontal individualist (HI), vertical individualist (VI), horizontal collectivist (HC) and vertical collectivist (VC) (Triandis and Gelfand 1998). Examining the horizontal-vertical dimension of the individualism-collectivism construct provides more clarity into the nature of people's perspectives on the individual and the collective. While researchers have examined various aspects of individualism and collectivism, the horizontal-vertical dimension may be one of the best ways of explaining individuals' belief in the equality versus inequality of cultural group members (Komarraju and Cokley 2008; Triandis and Gelfand 1998). In general, individuals score highly on the horizontal dimension when they believe that one person is generally the same as, or equal to, another person (Triandis and Gelfand 1998). That is, they tend to discourage competition and attempts to be better than others,

encourage equality and value the ability to be uniquely oneself without comparing oneself to others (Komarraju and Cokley 2008). In contrast, people scoring highly on the vertical dimension value hierarchical social relationships and view people as different from one another (Triandis and Gelfand 1998). They tend to prioritize achievement, social comparison, competition, status and achievement and accept inequality (Komarraju and Cokley 2008).

Researchers have studied cultures around the world to examine the extent to which they fall within the four horizontal-vertical individualism-collectivism (HV/IC) classifications. For example, the United States, the United Kingdom and France are seen as VI, though differences arise, particularly when looking at subcultures (Komarraju and Cokley 2008; Rabi S. Bhagat 2002; Triandis and Gelfand 1998). VI societies value autonomy and independence (individualism) but also competition and trying to be the best (a vertical perspective) (Komarraju and Cokley 2008). Norway and Sweden are examples of HI societies, which value self-reliance, uniqueness and the ability to express their individuality (individualism). However, HI cultures also view group members as having equal status and are less likely to compare themselves to others in the group (a horizontal perspective) (Komarraju and Cokley 2008; Triandis and Gelfand 1998). In contrast, VC societies, such as India and China tend to identify with the group (collectivism), accept their position within a hierarchy and forego their personal interests if required by the group's authorities (a vertical perspective) (Komarraju and Cokley 2008; Rabi S. Bhagat 2002). Finally, HC societies also identify with the group, family and community (collectivism) but at the same time feel that they are equal to other group members and do not yield to authority in the way that VI societies do (a horizontal perspective) (Komarraju and Cokley 2008).

While the U.S. is characterized as individualist overall, researchers have found that ethnic minorities within the U.S. such as African and Asian Americans are often more collectivistic in nature than European Americans (Coon and Kemmelmeier 2001; Phinney 1996). For example, amongst African Americans, the extended family, co-workers, neighbors and friends have been shown to be particularly important sources of social support (Kim and McKenry 1998). The difference in collectivist orientation between minority groups and European Americans is often attributed to the ethnic

group's country of origin (Coon and Kemmelmeier 2001). For example, researchers have argued that collective unity and kinship characterized West African culture and that these values were carried over as slaves were taken from West Africa and brought to the United States. Furthermore, slavery is said to have further solidified and surfaced communal values amongst African Americans (Komarraju and Cokley 2008).

Collectivism is also a construct that researchers have said is particularly important to consider when addressing health in the African American community (Kreuter and Haughton 2006). For example, Ashing-Giwa notes that in the African American culture a woman's identity is often defined in terms of her relationships (Ashing-Giwa 1999). The plethora of health interventions for the African American population that focus on the family and community further point to the value of taking a collectivist approach (Baffour, Jones and Contreras 2006; Feathers et al. 2005; Karanja 2002; Sbrocco et al. 2005). While researchers have translated the concept of collectivism into health communication materials and educational programs (Karanja 2002; Kreuter et al. 2004; Kreuter et al. 2003), they have not examined how to do so in a technology designed to address African American nutrition. This is a contribution of my research: providing concrete examples and recommendations for translating the concept of collectivism into technologies that encourage healthy eating habits.

Research on the African American culture has often implicitly assumed that because this culture tends to score highly on measures of collectivism it is lower on measures of individualism (Coon and Kemmelmeier 2001). However, growing evidence has shown that, contrary to popular assumption, the individualism and collectivism scales are not bipolar and that it is possible for individuals to score highly on both scales. In fact, some researchers have argued that previous research has failed to appreciate just how individualistic the African American culture is (Jones 1997; Komarraju and Cokley 2008). For example, in their work, Komarraju and Cokley found that African Americans scored higher on the HI dimension than European Americans while European Americans scored higher on VI (Komarraju and Cokley 2008). This finding may be explained in part by research describing the nature of *expressive individualism* in African American culture whereby individuals present their identity as being part of yet distinct from the notion of a monolithic "African American" culture through style, dress, artistic productions and

other such means (Jones 1997; Komarraju and Cokley 2008). Thus, while numerous researchers have designed health interventions that account for the value of the in-group, less research has examined how simultaneous values of individualism and collectivism or even a preference for individualism over collectivism may impact the way that people receive collectivistic interventions. In my research, I address this issue by examining the relationship between people's position within the horizontal-vertical individualism-collectivism framework and the way in which they react to and use collaborative health technology.

2.2.4 Culturally-Focused Health Interventions

As I have alluded to thus far, the health community has designed a number of health interventions that target the health of the African American community by mirroring and accounting for the distinguishing characteristics of this ethnic group. For example, Karanja *et al.* solicited feedback from African American women as to how a weight loss intervention (consisting of nutrition and exercise classes) should be tailored to fit their particular needs and desires (Karanja 2002). They used their empirical findings together with recommendations from health literature to design the "Steps to Soulful Living" intervention. The authors found that it was important to tailor the intervention to account for family and community (collectivism), facilitate a sense of cultural identification between the intervention team and participants (*e.g.,* include weight loss counselors who were African American) and help participants feel a sense of program ownership. This last point was a reflection of the fact that participants were concerned about how African Americans are portrayed in health research and in the media. Thus, participants felt that if they had a sense of ownership in the intervention, they could help make sure they were portrayed appropriately and that the information they provided was treated with care. The authors incorporated these findings into the intervention design by 1) encouraging participants to bring their families to the intervention sessions, 2) including African Americans on the intervention team and 3) allowing participants to guide the discussions in the sessions and design the study logo, name and advertisement materials. Karanja *et al.* found that the "cultural adjustments" made to their intervention

led to significantly higher weight loss than in other studies that did not account for culture in these ways.

A number of interventions have taken *faith-based* approaches, leveraging the prominent role of churches and spirituality in many African American communities (Fitzgibbon 2005; Kreuter et al. 2003). The church setting is also seen as a promising one because many churches in this demographic have existing health ministries and hold health-oriented activities. In addition, since many African Americans identify with a church, faith-based interventions may increase participation in interventions (Sbrocco et al. 2005). For example, Sbrocco *et al.* compared the effects of holding an obesity treatment program in a university setting and a church setting (Sbrocco et al. 2005). They found that the African American church group had significantly greater weight loss than the university group. Reniscow *et al.* created an educational video about nutrition that incorporated religious themes (Resnicow et al. 2001). They developed the video by getting input from local pastors on message content and the project's logo and name.

Other researchers have also examined how to design culturally relevant multimedia that promotes healthy eating. Campbell *et al.*, for example, created a soap opera video in which a man dies of a heart attack because of his poor dietary habits (Campbell 1999). As the video progresses, the man's widow is persuaded to improve her eating habits as well as those of her children. The researchers derived implications for the video design after completing formative interviews with a group of predominantly African-American women about topics such as where they usually obtain their health information and their preferred television program genre. Apart from these examples, there are very few examples of technology being designed to account for the cultural effects on eating practices and attitudes. Given the successful design of technologies to address health issues in the general population, there is opportunity for exploring how health technologies can be adapted for specific cultural groups. In my research I not only examine a technological approach but how such an approach can support lay people in creating digital media that promotes healthy eating.

2.2.5 Lay Health Advisors

Another class of interventions has focused on developing lay health advisors (LHAs), members of the community that are trained by health professionals and researchers on health topics (*e.g.,* regarding nutrition issues), leadership skills, effective community networking (*e.g.*, with local health organizations) and delivering health interventions to fellow community members (*e.g.,* increasing residents' knowledge of local health services) (Hinton et al. 2005; Raczynski et al. 2001). LHAs may be recruited through community-based organizations, neighborhood groups or word of mouth (Plescia, Groblewski and Chavis 2008). LHAs are encouraged, and receive the support to take responsibility for improving the health of their friends, family, neighbors and community by gathering new skills and knowledge and encouraging others to do the same (Plescia, Groblewski and Chavis 2008). As such, the LHA model reflects a strongly collectivist orientation. The LHA's outreach often takes the form of sharing information about health resources, services and self care practices with residents, providing health screenings and organizing support groups (Auger and Verbiest 2007; Plescia, Groblewski and Chavis 2008; Wilson et al. 2008). The LHA model places an emphasis on spreading health information and care by leveraging the existing social network of trusted members of the community. One study found that LHAs interacted much more with friends, family and co-workers than strangers (Thomas, Earp and Eng 2000).

The LHA model has been effectively used in ethnic minority communities to address health disparities and it was first advocated by the federal government as a means of reaching underserved populations (Auger and Verbiest 2007; Plescia, Groblewski and Chavis 2008). LHA interventions have effectively addressed a number of health issues, for example, they have helped community members engage in breast self-examinations (for breast cancer detection), manage diabetes and improve dietary knowledge and habits (Feathers et al. 2005; Wilson et al. 2008). While health information from medical professionals may be inaccessible or laden with jargon, lay health advisors can provide information that is understandable and culturally meaningful (Auger and Verbiest 2007). Furthermore, by leveraging members of the community (as opposed to outside clinicians or medical experts), this approach helps to reach people who have not sought care previously and overcome issues of distrust in medical researchers and professionals

(Brach and Fraserirector 2000; Feathers et al. 2005; Gamble 1993). The lack of trust in the medical establishment within minority and low-income populations is well-documented and stems from issues such as racial discrimination in medical care (as manifested by a perceived lower quality of care) and past human rights violations on the part of researchers (*e.g.,* in the Tuskegee experiment) (Corbie-Smith, Thomas and St. George 2002; Gamble 1993; Lillie-Blanton et al. 2000). In summary, these interventions help increase communities' capacity to address health concerns by providing them with valuable skills and resources.

The LHA model also provides important benefits for the LHAs themselves. First, their confidence in their *ability* to advise others is often increased as they see that others found the information they shared to be valuable (Auger and Verbiest 2007; Zuvekas et al. 1999). Second, they feel that they are *effectively improving* the health of the community (Auger and Verbiest 2007). In my dissertation research, I examined the extent to which a technological approach to facilitating lay health advising engenders these same benefits for system users.

While LHA interventions have had widespread success, a number of outstanding challenges and questions remain. First, previous interventions have often been labor-intensive for the LHAs (Swider 2002). In my work, I look at the effectiveness of providing a less labor-intensive means of allowing community members to care for one another. Second, researchers have argued that more work should examine what characteristics make someone an effective LHA (Swider 2002). In my research, I will examine how one's orientation within the horizontal-vertical individualism-collectivism framework affects their participation in an LHA-inspired technological intervention. Third, Plescia *et al.* (Plescia, Groblewski and Chavis 2008) note that a key factor in the success of LHA approaches is the ability of the lay health advisor to develop relationships with individuals in the community. In my dissertation work I examine the extent to which a technological approach can facilitate these relationships and connections.

2.3 Technological Approaches to Health Promotion

Health is a growing topic of interest within the HCI community and related disciplines such as Ubiquitous Computing (Ubicomp) and Computer-Supported Cooperative Work (CSCW). Researchers have shown the potential of technology to support medical professionals improve the delivery of healthcare, but also to help lay people live out their everyday lives more healthfully. It is the latter that I focus on in this section, as my dissertation research involves designing systems for lay people. Much of the work in this area has been referred to as *persuasive technology*, that is, systems specifically designed to alter users' behaviors and attitudes (Fogg 2003). Over the past decade, persuasive technology design has become a major area of focus, particularly for individuals interested in developing tools that help people achieve their wellness goals. For example, Consolvo *et al*. developed a set of design guidelines for future persuasive tools based upon well-established health behavior theories, such as the importance of providing trending and historical views on a person's behavior over time (Consolvo, McDonald and Landay 2009). Medynskiy *et al.* also developed a set of recommendations for persuasive technology design, basing theirs on strategies used in health self-management interventions in the medical domain (Medynskiy, Yarosh and Mynatt 2011). For example, they suggest that future tools support users in setting specific, short-term behavior change goals that the user feels are attainable.

However, some researchers have been less optimistic about the current trends in persuasive technology literature, arguing for increased caution in the design of persuasive systems. For example, Purpura *et al.* warn of the importance of examining the point at which persuasive encouragement to modify one's behavior turns into coercion and the point at which the monitoring of health behaviors brings up critical issues of surveillance and privacy (Purpura et al. 2011). The existing body of work on persuasive technology has shown that there are many ways in which systems can be designed to help individuals live healthier lives. Exploring this design space with an appreciation for the implications of different design decisions is important. In my work, I have taken an approach that has been understudied within HCI and related fields: helping local communities encourage one another towards healthier living. In the chapters that follow, I unpack the implications of that design decision. In particular, I will discuss the impact of tools that

support community-based care on the way in which individuals think about and manage their own health, as well as how they work to improve the health of the community.

Before discussing my own work, I will describe in more detail some of the previous work on health technology, a domain in which researchers have shown increasing interest. The growing ubiquity of computational devices, platforms and services has made it easier to monitor, store, aggregate and share health information (Eng et al. 1998; Grimes, Tan and Morris 2009; Intille 2004). This technological landscape has created a unique and exciting opportunity for HCI researchers to explore the design of health technology. In this section I overview the three classes of tools that are most relevant to my dissertation work. First, I discuss systems that support behavior and attitude change by facilitating reflection and expert feedback on behaviors. Second, I overview the growing body of research on tools that help individuals manage their health in social contexts. Third, I conclude by focusing on one particular class of social tools: online health communities.

2.3.1 Support for Reflection & Expert Feedback

Much of the work on health within HCI has focused on helping people to better monitor their health behaviors. In doing so, these applications help users become more aware of their behaviors and to reflect upon them. In addition, some tools provide users with feedback to help spur them towards healthier behaviors in the future.

Supporting Reflection & Awareness

Medical research has shown that monitoring one's health-related behaviors and physiological measures (such as diet, exercise and weight) can effectively help people reach wellness goals like weight loss. Reflection is an effective means of reaching such goals because people become more aware of and discriminating in their behavioral decisions (Wing and Hill 2001). However, challenges with self-monitoring include its labor intensiveness, individuals' discomfort with recording data and life stressors which can keep people from adherence (Patrick et al. 2009).

To address these and other barriers, researchers have developed a number of tools that attempt to make monitoring easier, more convenient and engaging. For example,

some researchers have used the medium of photography to help people vividly documenting their behaviors (Brown 2006; Smith et al. 2007). Brown *et al.* (Brown 2006) designed a cell phone application that supports users in maintaining a photographic diet and exercise journal. The purpose of this system was to help individuals reflect upon their fitness practices in a meaningful and visually impactful way. The MAHI system leveraged a networked cell phone and glucose meter to help diabetes patients photograph meals and analyze how their eating practices are related to glucose readings (Mamykina et al. 2008). MAHI thus helps users better understand the relationship between their health-related behaviors (such as eating) and their physiological state (*i.e.,* blood sugar levels), such that they will hopefully make healthier decisions in the future.

In addition to creating visual records of fitness-related practices, researchers have designed systems that help people maintain other types of electronic food journals. For example, Siek *et al.* developed a PDA application that allows users to build a food journal by scanning the barcodes of foods eaten or by recording voice entries (Siek 2006). Tsai *et al.* developed PmEB, a mobile phone system that helps people log their diet and exercise activities, examine corresponding calories consumed and burned, and see a history of activities (Tsai 2007). In addition to these academic projects, there are many commercial web and cell phone based applications available that similarly support individuals in manually logging their diet and exercise activities[7].

Advances in sensing technologies have allowed for increased automatic tracking and monitoring of behavioral and physiological health information. Systems that leverage this technology attempt to more completely remove the burden of having to record one's information manually. For example, the BodyBugg[8] is a commercially available armband that uses a set of sensors to estimate an individual's caloric expenditure. Researchers within HCI have also explored methods of inferring and tracking physical activity (Albinali et al. 2010). For example, some researchers have combined custom-built sensing devices with cell phone software to infer the nature of a user's activity (*e.g.,*

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[7] For example, www.fitday.com and www.myfooddiary.com.
[8] http://www.bodybugg.com/

walking versus using an elliptical trainer) and provide that information to the user for review (Consolvo et al. 2008a). Other researchers have leveraged pedometers to track a user's physical fitness activity (Consolvo 2006; Toscos 2008).

While much research on monitoring health behaviors has focused on physical activity, some systems have been developed to track eating behaviors as well. For example, Chang *et al.* developed a dining room table that tracks a person's meal consumption by sensing food moving from a serving container to an individual's plate (Chang 2006). Through a combination of RFID and weight sensors, the system tracks the quantity and type of food consumed. Other researchers have created sensor-augmented cutting boards and kitchen knives (Kranz 2007) as well as on-body sensors (Amft 2008) for inferring the foods people are cooking and eating. While these applications allow users to reflect upon the recorded information, one potential drawback to automatically recording behaviors is that it may remove the process of critical self-assessment and regulation that happens when individuals have to document behaviors themselves (Connelly et al. 2006).

Feedback on Current Habits

Researchers have also explored ways of providing individuals with feedback on their current eating behaviors. The PNA (personal nutrition assistant) is a web-based tool that allows individuals to receive a nutritional analysis of what they eat on a daily basis (Beidler et al. 2001). Users create a food journal within the application and the PNA system displays the caloric breakdown of each meal as well as the number of carbohydrates, protein, and fat in the meal. In addition, the results of these analyses are made available to health care providers so that further support can be provided to the user. HyperFit (Jarvinen et al. 2008) is a similar online system that provides users with feedback on their food journal entries and assesses the users' progress towards their fitness goals. HyperFit differs from PNA because people can use their cell phone to construct their journal by scanning the barcodes of foods they eat. Kim *et al.* took yet another approach by designing a system that uses image recognition software to provide a caloric assessment of users' photographic food journals (Kim et al. 2010).

Mankoff *et al.* also developed a tool that provides users with feedback on their food choices (Mankoff 2002). This novel system analyzed grocery store receipts to determine the user's purchases and provide suggestions for making healthier future selections. Chi *et al.* sought to provide feedback to users "just-in-time", that is, as they are actually preparing meals (Chi et al. 2007). These researchers used sensors to detect what users were cooking in the kitchen (*e.g.,* chopping bacon) and inform them about the nutrients in their ingredients. Upon receipt of this feedback, the goal is that users might be able to cook more healthfully in the future (*e.g.,* reducing the fat content by using less bacon). Chi *et al.* argue that giving users this type of feedback is important because people feel better about themselves when they are able to prepare healthy foods for their family.

2.3.2 Social Health Applications

In addition to some of the more individually focused projects described thus far, researchers have developed a number of health applications that focus on social groups. For example, work has focused on supporting the relationship between elders and their caregivers (Consolvo 2004; Mynatt 2001), helping families track child development and medical data (Jeong 2008; Kientz 2007) and supporting nuclear family units on reflecting upon and discussing health data (Grimes, Tan and Morris 2009; Kimani et al.).

Much of the social health research within HCI-related fields has focused on helping people share information about their physical activity with friends and coworkers (Consolvo 2006; Lin 2006; Maitland 2006; Toscos 2008). These projects are motivated by the hope that by facilitating such transparency, systems can help people encourage one another to be more active. This encouragement can be provided through social support (*e.g.,* friends motivating each other to be more physically active) or social pressure (*e.g.,* trying not to look bad in front of one's peers). These applications often support competition and electronic communication around shared health information.

Competition is frequently facilitated in these systems both as an articulated design goal and through the way users appropriate the system. For example, TripleBeat is a mobile phone system that helps runners achieve their goals, in part by allowing them to compete with other system users to effectively stay in their target heart rate zone during a

run (Oliveira and Oliver 2008). Users have reacted positively and negatively to competition that is based upon the physical activity of individuals within a social network. Houston (Consolvo 2006) is a cell phone application that allows users to share the number of steps they take each day (step counts) with friends. In a field trial of Houston, researchers found that participants were motivated to increase their step counts so that they could "beat" their friends. Shakra is another mobile phone application that supports people in sharing and comparing their activity levels with friends and coworkers (Maitland 2006). The authors found that system users enjoyed competing with one another even when they had less physical activity than others. Users of the Fish'n'Steps system (Lin 2006) (another application that allowed coworkers to share their step counts) also enjoyed the competition because it gave them a benchmark with which to compare their progress. However, some participants did feel that competition was in conflict with the spirit of the system. Other researchers developed a mobile phone application that allows middle school girls to share their step counts (Toscos 2008). They found that some participants liked the competitive nature of the system, while others found it to be negative (*e.g.,* because it might be unhealthy for a friendship).

In addition to competition, social health systems often facilitate communication about health behaviors. The Playful Bottle system is comprised of a water bottle that is instrumented with camera and accelerometer sensors that track the amount of water a user consumes. This data is then shared with the user's coworkers and the system facilitates electronic communication whereby users can encourage one another to increase their water consumption (Chiu et al. 2009). The Houston system (Consolvo 2006) allows users to share comments along with step count information. In a field trial of Houston, researchers found that participants enjoyed the encouragement and praise that their friends provided in these comments (Consolvo 2006). However, this type of messaging support has been less successful in field trials of other systems. For example, because participation and messaging in the Fish'n'Steps system (Lin 2006) was anonymous, participants were not comfortable using the application's communication feature. Toscos *et al.* found that very few messages in their step count-sharing application were motivational because the users (young girls) did not know how to craft an encouraging message (Toscos 2008). Thus, while helping social networks to

communicate about their health behaviors may be a promising way of utilizing technology, some researchers have found it challenging to do so effectively.

While much of the previous work on social health applications has focused on friends, coworkers and family members, my work extends this research by examining the sharing of information about one's health-related behaviors for the benefit of a social group which has been underexplored in HCI: one's local community. In particular, I studied individuals who have a shared ethnic identity and geographic reference frame because they live in or frequent the same local area. Furthermore, though previous work has extensively explored competition as a motivating element in health applications, I explore a different motivator: the collectivistic value of social cooperation whereby people share personal health-related information primarily to benefit others. The notion of cooperation is central to the success of many online health communities, which I overview in the next section. However, my work differs from that research in that I explore cooperation within local communities as opposed to the global network that many online health communities serve.

2.3.3 Online Health Communities

While the previous social health applications have focused mainly on existing social networks, online health communities help people to communicate about health with a much broader group of people (Kummervold et al. 2002; Leimeister and Krcmar 2005; Maloney-Krichmar and Preece 2005). Online health communities are the canonical example of computer-mediated environments that support health information exchange amongst everyday people. These environments have been implemented in a number of formats, including discussion boards and chat rooms (Frey 2003). Online support groups exist for a range of health topics, including weight loss, injuries, addiction, and cancer management (Frey 2003; Maloney-Krichmar and Preece 2002). They supplement services that health care providers give by helping individuals address health-related needs beyond medical treatment, including their cognitive, spiritual and affective needs (Johnson and Ambrose 2006). These needs are met as community members share experiential knowledge, provide peer support and gain a sense of empowerment (Kummervold et al. 2002).

The information shared in online communities is quite diverse: members may provide information about health issues, referrals to experts, interpretations of illness symptoms or guidance for coping with a disease (Coulson 2005; Frey 2003). Frequently the information shared is personal. Salem *et al.* (Salem, Bogat and Reid 1997) found that in an online health community for individuals coping with depression, people were four times more likely to share experiential knowledge than information gleaned from second-hand sources. These results contrasted previous work that in face-to-face support groups, impersonal information is actually shared more than personal information (Salem, Bogat and Reid 1997).

Beyond information sharing, online health communities are great venues for helping people provide social support to others. One study found that roughly half of the messages posted in an online health community provided social support such as emotional encouragement (Salem, Bogat and Reid 1997). Braithwaite *et al.* also found that emotional support was provided in the empathetic and encouraging messages shared in an online community for people with disabilities (Braithwaite, Waldron and Finn 1999). Similar to encouragement is the notion of empowerment, and online health communities may be particularly useful for facilitating this positive effect amongst members. For example, Maloney-Krichmar and Preece studied an online knee injuries community and found that through the information gained from the community, members became empowered to interact more effectively with healthcare workers (Maloney-Krichmar and Preece 2005).

The technological approach of my research is most similar to previous research on online health communities. One of the main benefits of these communities is that they make it possible for individuals living throughout the world to share their experiences with one another (Maloney-Krichmar and Preece 2005; Salem, Bogat and Reid 1997). However, in my research I explored the implications of helping people to care for and address the health issues of people living in the same local geographic area. In addition, while online health communities typically support people in sharing their experiences through textual commentary on personal computers, the systems that I have developed allow people to share their commentary via cell phones and an interactive public display (computational tools that may be more accessible to a low-income demographic). Finally,

my research also looks at how accessing this content affects how individuals in low-income African American neighborhoods conceive of the health of their community.

2.4 Discussion

Researchers within HCI and related fields have shown the promise and effectiveness of designing technology to help people manage their personal wellness. While these projects represent a successful foray into the design of health technologies, few tools have sought to reduce the extreme health disparities that exist within the United States. Furthermore, existing tools rarely explicitly account for the role that culture plays in people's health behaviors and attitudes. Rather, in the design of persuasive tools, health and wellness have often been treated as undisputed values in and of themselves. And, while this is certainly a reasonable approach to take, it neglects the underlying values that affect health practices. As the medical community has pointed out, accounting for the values that shape eating practices – particularly in the African American community – can help us create health interventions that are more effective and appealing. Furthermore, it is critical to take into account the cultural affects on eating practices because neglecting to do so may lead to interventions that cause people to feel socially and culturally isolated (Airhihenbuwa 1996; Horowitz 2004).

While previous HCI research has focused on developing persuasive tools that encourage better eating habits and exercise practices, researchers have rarely questioned how the persuasive elements of such tools may need to be modified to resonate with users' cultural values and traditions. For example, various researchers have designed tools that help friends and coworkers encourage one another to exercise more (Consolvo 2006; Lin 2006; Toscos 2008). However, HCI research has rarely focused on the way in which cultural values may shape one's desire to use social tools or the way in which the social features of the system should be designed. For example, as I have discussed in this chapter, certain cultural groups may have an increased collectivistic desire to care for the health and wellness of other group members. When studying these groups, it is therefore valuable to examine how a (culturally grounded) feeling of responsibility for the health of others might affect the way in which future systems should be designed. In addition to designing social health systems, researchers have developed tools that persuade users to

eat better by informing them about the nutritional value of the foods that they prepare and consume (Chang 2006; Mankoff 2002). However, HCI researchers have rarely examined *why* users eat the foods that they do and how cultural traditions may be shaping these behaviors. In my dissertation work, I took an initial step towards addressing the lack of focus on culture by designing two systems that reflect an appreciation for the relationship between culture and health and by examining the impact and adoption of these tools.

While culture has been understudied in HCI health research, public health researchers have taken a variety of approaches to designing culturally focused health interventions. One approach has been to train and support LHAs. This has been an effective approach, yet challenges include the intensive labor required of LHAs and finding individuals who have extensive social networks (such that they will increase their potential for influence). My research is motivated by the following assertion: technological interventions inspired by the LHA model represent a promising way of overcoming these challenges by providing ways for individuals to care for their community and connecting them to a broader network of community members.

In addition to culture, the impact of living in a low-income community should be examined as well. Yet much research on health technology has been economically neutral, not examining the particular needs of low-income individuals. Important exceptions to this include the work of Siek *et al.* and Maitland *et al.* to derive design implications for technologies that meet the health-related needs and concerns of low-income caregivers and children (Maitland 2006; Siek, LaMarche and Maitland 2009). I extend this research by taking the results of my own formative fieldwork and translating them into the design of two systems that I rigorously evaluated. Furthermore, while their work was heavily focused on families, my research focuses on community-level interventions and examining the benefits and challenges in such an approach. Another important body of work has focused on using technology to address healthcare issues in developing countries. For example, Ramachandran *et al.* examined the impact of user-generated cell phone videos that encourage pregnant women to use maternal health services in rural India (Ramachandran et al. 2010). My work is a contribution to and extension of this growing body of work on health technology for underserved populations because I examine the role of collaborative health technology within the developed

world, particularly focusing on the creation and consumption of community-authored healthy eating ideas and how this content affects the behaviors and attitudes of community members.

In the chapters that follow, I describe my formative research, the two systems that I designed as a result of this fieldwork and the evaluation of these systems.

CHAPTER 3

IDENTIFYING DESIGN GUIDELINES

3.1 Introduction

The literature review provided in the previous chapter forms the foundation and motivation for my dissertation research. As I discussed, medical researchers and practitioners have overwhelmingly advocated that health interventions account for the cultural affects on health behaviors and attitudes. By examining previous work within the public health and nutrition domains, it became clear to me that before designing an intervention, it is critical to deeply understand the common nutrition-related behaviors and attitudes amongst African Americans living in low-income communities. Previous research on this topic provides an answer to the second part of RQ1: *What socio-cultural considerations should be taken when designing technologies to promote healthy eating in low-income African American communities*? Below, I elaborate on this answer by briefly reviewing key points from my examination of previous research (discussed in detail in Chapter 2) and discussing the implications for health technology design.

First, research has shown that it is important to understand the nature of soul food cuisine amongst African Americans, including the way such foods are prepared and the value of these foods. For example, while soul food may be commonly consumed, it is also often prepared in an unhealthy manner. Accordingly, researchers have designed health interventions that specifically help participants prepare these foods more healthfully (*e.g.,* workshops in which people learn to modify cultural recipes) (Williams 2006). Similarly, technology designers attempting to create interventions that address African American nutrition must do so in a way that accounts for the existence of the distinctive soul food cuisine.

In addition, researchers widely recognize that cultural groups use foods – their flavors, and the ways in which they are prepared – to help preserve traditions and maintain group identity (Airhihenbuwa 1996). Patterns of consumption can also be tied to aspects of culture. For example, Airhihenbuwa *et al.* (Airhihenbuwa 1996) note that the older African American participants in their study had a preference for eating at home

because of the racial discrimination that they had experienced in restaurants in the past. The meaning that people attach to specific foods, and the reasons behind why they engage in health behaviors are important to consider when designing technologies that mediate what, and the ways in which, people eat. While cultural norms are not the only influences on eating practices (personal factors and family norms also play an important role), they are significant enough that technology designers attempting to mediate eating practices cannot overlook them.

Previous work also shows that when designing interventions for low-income African American populations, it is critical to study the aspects of the physical and social environment that shape a person's ability and desire to eat healthfully. For example, Stolley and Fitzgibbon's intervention for low-income, African American families reflected sensitivity to the limited availability of foods within their participants' neighborhoods (Stolley and Fitzgibbon 1997). Similarly, when designing a technological intervention it is also critical to account for the barriers and supports that exist within users' physical (*e.g.,* geographical) and social (*e.g.,* community or familial) environment.

Because of the importance of understanding the way one's culture and environment shapes eating behaviors and attitudes, I conducted a formative empirical study to examine these topics and derive design implications in the context of my specific demographic: African Americans in Southwest Atlanta, GA, a low-income area of the city. This research helped me to answer RQ1: *With what aspects of nutrition are individuals in low-income African American communities most interested in receiving support and what socio-cultural considerations should be made when providing this type of support?* In the following sections I describe my formative fieldwork in detail. In Chapter 4 I discuss how the results of this study informed the design of the EatWell system.

3.2 Formative Fieldwork Method

I conducted a field study with 15 participants to explore the food-related attitudes and practices of African Americans in low-income neighborhoods in Atlanta, GA, USA (Figure 1). Kreuter and McClure argue that to begin to understand the cultural characteristics of a group, it is important to look at sub-groupings within the population

Figure 1. A local market in the neighborhood studied in my formative fieldwork. It advertises prominently that it accepts food stamps and sells chicken wings. Low-income African American neighborhoods have far fewer supermarkets and less access to healthy foods than affluent, predominantly Caucasian neighborhoods.

(Kreuter and McClure 2004). Health researchers have found it useful to focus on specific regional subsets of the African American population to better identify individuals with a shared food culture (Ahye, Devine and Odoms-Young 2006). As such, I have focused my research on the particular eating practices of individuals in Southwest Atlanta, GA, an area where the poverty level is higher than the state average and the annual household income level is well below the state average[9]. Participants came to two sessions. In the first session they completed a survey and participated in a focus group. In the second session they completed a participatory design activity, again in a group setting. Two Master's students assisted me in these sessions by taking notes, distributing study materials and asking participants follow-up questions as I interviewed them. Participants received a $10 gift card if they attended the first session and another $10 gift card if they attended the second session.

[9] In 2009, the poverty level for the zip code in which the YMCA branch is located was 23.5% (compared to 16.5% for the state of Georgia) and the estimated median income level was 35% lower than the state average. For more information, see: http://www.city-data.com/zips/30311.html.

3.2.1 Session One: Survey & Focus Group

At the start of their first study session, participants completed a survey that consisted of three components. First, participants answered demographic questions about their age, household size and occupation. Second, they answered questions about their nutrition-related behaviors and attitudes. For example, participants were asked where they purchased groceries, how frequently they purchase groceries, and how frequently they eat at restaurants. I also included questions that assessed health attitudes, for example, how satisfied they were with their current eating habits and whom they felt could give them useful and truthful information about nutrition. Finally, the survey contained questions about technology ownership and access, including cell phone ownership and usage, and Internet and computer access.

After completing the survey, I led participants in a focus group discussion (see Appendix A.1). The focus groups had between three and eight participants each. I asked participants questions regarding their personal eating practices as well as those of their family members, attitudes towards the affect of community resources such as grocery stores on their eating habits, to what extent they feel that there is a distinctive set of African American cultural foods, and their experience with trying to maintain a healthy diet. The focus groups provided insight into the second part of RQ1 (*what socio-cultural considerations should be taken when designing technologies to promote healthy eating in low-income African American communities?*).

3.2.2 Session 2: Participatory Design Activity

Participants came back for a second session in which I used a participatory design activity to help them convey what they would like to see in a technology that supports healthy eating (Figure 2). Thus, these sessions helped me to directly answer the first part of RQ1: *With what aspects of nutrition are individuals in low-income African American communities most interested in receiving support?* The participatory design sessions were structured as inspiration card workshops (Halskov and Dalsgård 2006). Participants were given two stacks of cards: a set of technology cards and a set of health activity cards. Each technology card had the name and picture of a technology such as “cell phone”, “refrigerator”, and “television”. Each health activity card had the name and picture of a

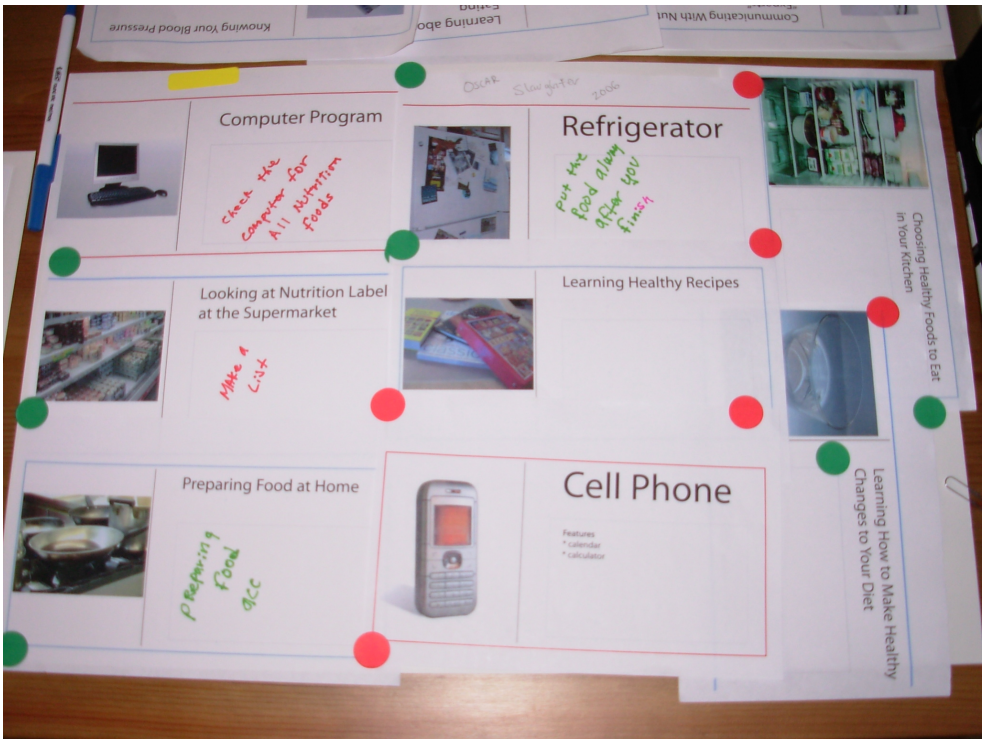

Figure 2. Participatory Design Session Artifact.

health activity such as "monitoring blood sugar", "keeping track of the foods you eat", and "learning how to make healthy changes to your diet". Participants were given blank poster boards and asked to create new technology concepts by matching cards from each set such that they showed which health activities they were interested in and the technology that they would like to help them with that activity (Figure 2). For example, participants might say that they would like their refrigerator to help them keep track of their blood sugar levels.

Participants were also given two sets of stickers to further annotate their design artifacts. The first set of stickers was used to indicate *with whom* they could see themselves using the technology or engaging in the health activity. The options for these stickers were Friends, Family, and By Themselves. The second set of stickers was used to indicate *where* they could see themselves using the technology or engaging in the health activity. The options for these stickers were Home, Work, and Other.

Finally, participants were encouraged to write comments on their design boards to further explain their ideas and to create new inspiration cards or stickers to indicate their

ideas. When participants completed this exercise they were asked to explain their design boards to the rest of the focus group. (The script used in these sessions can be found in Appendix A.2.)

While I instructed participants to pair technology and health activity cards, they rarely followed these instructions precisely. Instead, most participants chose the health activity cards that they were interested in receiving help with and the technology cards that seemed relevant to health and then taped them separately to their pieces of paper. They used the stickers to annotate their health activity cards, indicating where and with whom they would like to do the activity. The way that participants engaged in the activity may indicate that they misunderstood my instructions or that they did not completely understand how to carry them out (*e.g.,* because they were not familiar with health technologies or comfortable imagining future systems). In either case, these sessions proved to be most useful for uncovering what nutritional activities people were most interested in receiving support with, not the technologies that they felt could help them engage in that activity. (I explored the latter topic through the design and evaluation of two systems, EatWell and Community Mosaic, which I describe in Chapters 4-6.)

3.2.3 Participant Overview

In doing this research, I recognized that the African-American culture is not homogenous and that regional differences, for example, might lead to a more varied set of experiences. Thus, in order to understand the cultural influences on eating practices, it was important that I include participants who had lived in the Atlanta area for an extended period of time. The majority of my participants had lived in this area for 30 years or longer. I recruited participants by making announcements at events organized by REACH for Wellness, a community health organization that provides health services to lower income individuals. I also advertised the study verbally to maintenance workers at Georgia Tech. One of the limitations of this study was that I did not ask participants to report their income level. However, by recruiting participants through REACH for Wellness I was able to increase the likelihood that my participants came from low-income households.

I advertised the study to adult males and females, however I had much greater interest from women. My study included 14 female participants and one male participant and I obtained demographic surveys for 14 of my 15 participants. My participants came from a range of age groups: five were aged 25-45, three 46-59, and six participants were 60 or older. Eight participants were either unemployed or retired. The remaining participants held a variety of positions including janitor, food service worker, administrative assistant, entrepreneur, and community health worker. Most participants were the primary preparers of meals in their home.

All but two participants said that they ate more meals cooked at home than at fast food restaurants. Most said that they were interested in learning how to make changes to the foods that they eat. In terms of technological ownership, just over half of my participants had cell phones (n=8), six had a computer in their home, two had an mp3 player, and one a digital camera. Five people said that they use a computer at a local community center.

3.2.4 Analysis

I transcribed the focus group sessions and the dialogue from the design sessions. I conducted a thematic analysis of these transcripts in which I first inductively coded the data to denote emergent phenomena (Thomas 2006). After arriving at this set of codes, I iteratively clustered related codes into groups. I then clustered those groupings into higher-level categories. These categories represent the themes that I will discuss in the following section. In addition, I analyzed the artifacts created by participants in the participatory design session to gain further insight into which cards and annotation stickers were most valued. Specifically, I tallied the number of times each inspiration card was used and the number of times each annotation sticker was used (*i.e.,* the stickers that denoted who participants would use the technology with, and where they would use it). Finally, I entered the survey data into Excel and computed descriptive statistics.

3.3 Results

My fieldwork highlights three main themes: 1) participants' rich history of experience with health issues, 2) the benefit of sharing these experiences and

participants' interest in learning new healthy eating strategies, and 3) the delicacy of appreciating the uniqueness of a culture's experience with health without ostracizing that group. These themes help answer RQ1 by detailing with what aspect of nutrition my participants most wanted support and the socio-cultural factors that arose as important when I examined participants' existing knowledge about healthy eating, attitudes towards health, and experience with trying to maintain a healthy diet.

3.3.1 A History of Experience

My participants richly described their history of trying to eat healthfully. Here I highlight two classes of experience that were particularly evocative and indicative of the issues that faced my target population. I first report upon the family history of nutrition-related health problems that participants described. Second, I describe participants' personal set of struggles with trying to eat healthfully given the nature of their socio-cultural context.

A Family History of Health Problems

Some of the most commonly discussed health issues affecting African Americans are high blood pressure, diabetes, and obesity because this segment of the U.S. population is disproportionately affected by these problems. My participants breathed life into the statistics that describe this health disparity by discussing their experiences with these issues. In particular, people told me how their family members had been afflicted with these diet-related health problems. These stories exemplify how my participants are experts in their own right about the particular health issues that affect their community because they have lived with and around them. For example, one participant (T2) told me about her mom's experience with diabetes:

> "She's not that type of person that had to shoot [insulin] needles. So I assume that it's not bad… she just take like some medicine. But she get around good to be 75 years old. She get around better than some of these young folk."

P8 described her niece's struggle with obesity:

> "I look at my niece. I mean, she [has been obese] just about from birth. Every time she eat, they go to the fast food places. She don't know how to cook. And it's a shame, she [weighs] almost 400 pounds herself."

This woman described her disappointment with her niece's health and assessed the cause of her problems as being her eating practices. Other participants assessed the healthiness of their family's cooking habits. As P7 told me,

> "I have a daughter that comes over to my house and cooks practically every day. And she cooks this food – in her vegetables she puts too much oil. Everything – and she eats meat… 3 or 4, 5 times a day eats meat. Just meat, meat – and her health is not that good either now. And I'm trying my best to get her to stop."

This quote begins to highlight how my participants became intimately involved with the experiences of their family members. For example, P7 described how her daughter's behaviors seeped into her life and how she was trying to help her to make healthier choices. Similarly, another participant described not only her uncle's health experiences but also how it affected her:

> "I don't do salt… because I know it'll run your blood pressure up. And I know that, I had an uncle that died from that. A great uncle where he was told by the doctor about using that salt. And he kept on kept on, kept on and he died."

As P2-2 described her mother's significant health complications, she also described how it affected her:

> "My momma died at 42 with high blood pressure, diabetes, the whole nine yards. She had a stroke. She was overweight… 200 pounds over…I got frustrated, angry for her dying and I [said] I'm not gonna be sick… I'm not gonna die early, I'm not gonna die early. Little did I know that when I got to [the age she was when she died], I contracted all her diseases: diabetes, high blood pressure, high cholesterol."

These accounts speak to the health problems that existed in the families of my participants and ways in which those problems sometimes led people to change their own habits. More importantly for the purposes of my research, people spoke openly and reflectively about the health-related problems in their families. It is in hearing about these experiences that I began to see that my participants had important stories to tell, stories that if shared might impact and encourage others that they are not alone in their experience.

Socio-Cultural Challenges with Eating Healthfully

In addition to sharing their family's health problems, my participants shared their personal struggles as well. In this section, I describe the nature of these challenges and the steps participants took to address them.

Challenge #1: Finding Healthy Food.

Some participants described the challenge of finding fresh, healthy foods in low-income, predominantly African American neighborhoods. These experiences reflect research that has shown that these areas have fewer grocery stores than predominantly Caucasian neighborhoods, and that low income neighborhoods have fewer grocery stores as well (Morland et al. 2002). For example, T3 noted the prevalence of fast food in her neighborhood as opposed to places where she would be able to purchase healthier options. P3 and P6 discussed the challenge of finding fresh vegetables in their neighborhood stores. They described having to either take the bus or get a ride from someone to get to grocery store that would carry fresh foods. P6 even described how she tried to convince a local store to improve the quality of their selection:

> "They don't have vegetables in our stores. A lot of times I want some lettuce to make a salad but they don't have it… I was telling the man the other day about getting collard greens and getting some … turnip greens or something like that... I told him that he would do good [sales if he sold those items]."

P2-3 also described the benefit of advocating for change in grocery stores. She felt that the grocery store near where her home was poorly stocked, and she felt this was because she lives in a predominantly African-American neighborhood. She confronted the issue directly:

> "The selections were very limited but I would ask and ask and ask, 'When are you gonna get in Tilapia? When are you gonna get in some fresh salmon?' … And you know I would go back every week, every week and ask. I don't think people know how to advocate for themselves. You know, you have a right. This is your grocery store."

Thus, my participants not only discussed the challenge of finding healthy foods, but steps that they had taken to confront this issue directly. Whether by conceiving of ways to get to stores with better selections or by advocating for change within their own neighborhoods, participants experienced adversity but also developed strategies for dealing with these problems.

Challenge #2: Economic Constraints

My participants also told me about the financial challenges of trying to eat healthfully. P2-1 described the effects that finances had on her family as a child:

> "I think it's just the fact that my family just didn't have money and we weren't able to eat the nice stuff … every day. Probably why I don't like beans to this day. [laughter] And uh, you know we just couldn't afford much at all um because you know, thinking about my grandparents, they were from the South… that kind of you know skewed me towards certain types of food."

Other participants also described challenges associated with the cost of food. For example, two people discussed how they do not eat at restaurants because it is too expensive to do so. Another participant said that she did not shop at one of the dominant grocery store chains in her city because their prices are too expensive. In addition, a couple participants noted how they utilized the resources of aid initiatives such as the WIC (Women, Infants, and Children) program, sponsored by the U.S. Federal Government. P2-2 used this resource as she raised her granddaughter with limited financial means:

> "I raised her on Ensure… because of her mother's financing, social security and debt, [I] had a good job and everything [but WIC] helped me to be able to give [my granddaughter], buy her Ensure. When you didn't get it [from a place like] WIC … it was very expensive."

Another participant described how she was able to get free soymilk given out by a local church once a month. This was an important discovery as some participants described soymilk as being a product that is typically expensive. The way in which the cost of foods affects consumption behaviors is an important point to consider for technology designers. Assuming even basic behaviors such as purchasing food from grocery stores, or that people will be eating frequently at restaurants may be inappropriate depending upon the particular socioeconomic context of the target user group.

Thus, in answer to RQ1, my results suggest that one socio-cultural consideration that should be made when designing technologies for this demographic is that these individuals often possess a rich history of experience. In particular, all of my participants' stories, both personal and family-related, highlight their culturally situated experience with trying to eat healthfully. By possessing these stories, strategies, and histories my results show that my participants are themselves a critical resource within the community.

3.3.2 Sharing Experiences & Learning New Strategies

Reaching Common Ground

As noted previously, my participants faced a common set of challenges around finding healthy food and negotiating the economics of eating. These shared challenges, together with a common set of foods that participants liked to eat helped them to reach common ground. Thus, the stories that people shared in the focus groups proved to be useful not only for me but for the other focus group members as well. For example, some participants discussed the benefits of cooking with olive oil and P8 shared one recipe for using a little oil to cook vegetables. As a result of hearing this discussion, P2 decided that she was going to try to incorporate olive oil into her own cooking. At another point in the focus group, the following discussion arose around cornbread:

> P2: I love cornbread.
>
> P1: My sister like that.
>
> P8: Gotta have that cornbread. …
>
> P4: They said don't eat cornbread with dry foods because that's your starch there but when I cook them butter beans and all that-
>
> P2: Oh girl, please, you gonna have to have some bread.
>
> P4: -and put those beans down low, I got to have the piece of little thin cornbread. I mean that's two starches right there. But it look like it just go together.

This discussion highlights the shared value of cornbread for participants, a common soul food dish. Their shared appreciation for this dish facilitated an easy discussion around it. Participants were also able to discuss shared experiences around other soul food dishes, for example as in the following discussion about chitterlings and pork (a common soul food dish and ingredient, respectively):

> P5: Hm, one day I was eating some chitterlings and … I caught a headache real bad. [I thought] OK, I'm not sick and I don't have a cold, what's wrong with me? So I just laid down and cried myself to sleep and then when I woke up the headache was gone. … So I said ok, this is pork, so I have to start putting … vinegar in it and I haven't had a headache since.
>
> P2: Yeah I heard of something like that before too.
>
> P6: That's the way I do mine anyway.
>
> P4: I don't know where I learned it from but I started doing it.

Beyond discussions of soul food, recall that in the previous section I discussed how one participant described getting free soymilk from a local church. This experience was shared as participants realized their shared taste for soymilk, and over the course of the discussion another participant suggested a store that sold it for a reasonable price.

All of these anecdotes exemplify how participants were open to sharing their experiences. They also point to the ways in which they easily related to one another through their food-related experiences and interests. Of course, the benefits of sharing information about health have been demonstrated in other contexts such as online health communities. However, what is interesting here is that the stories shared were rooted in participants' sense of common ground, which was facilitated in part by their shared socio-cultural context (*i.e.,* common cultural foods and challenges resulting from living in an impoverished neighborhood).

Interest in Learning New Strategies

In addition to being open to sharing their experiences, in the participatory design sessions I found that participants were most interested in improving their understanding of how to eat healthfully, particularly at home. The two most frequently used health activity cards were related to learning about healthy eating: "Communicating with Nutrition Experts" and "Learning About Healthy Eating". This is compared to a lower interest for example, in "Keeping Track of the Foods You Eat". In terms of technology, the three most commonly used technology cards in the design sessions were "Refrigerator", "Television", and "Online Community". These technologies were seen as objects that were either current or potential sources of information about nutrition such as healthy recipes. While much health research within HCI has focused on helping people monitor and reflect on their behaviors, my results suggest the promise of designing tools that support people in learning how to develop healthier habits.

The results in this section further answer RQ1. That is, in answer to the first part of the question, participants were most interested in receiving technological support for learning new strategies for healthy eating. In addition, my results highlight the benefits afforded when individuals from a shared socio-cultural context share their nutrition-

related experiences with one another, that is, my participants were able to deftly negotiate common ground and were open to doing so.

3.3.3 Appreciating Cultural Uniqueness Without Ostracizing

The themes I have discussed thus far represent some of the particularities of my participants' experiences as African-Americans living in low-income neighborhoods in the Southern U.S. However, upon further analysis of the interview responses, I realized that I began this study with a distinct bias in terms of how I viewed the state of African American health. Based on the abundance of health research on the diet-related disparities within this community, I did not see the statistics about this phenomenon as being potentially controversial. I also accepted the public health community's recommendation of treating this group as culturally distinct, having particular nuances that are important to consider. While as noted above, I certainly had results that confirm the fact that there are particular and unique characteristics of this cultural group, it was interesting to see the ways in which a few participants reacted against the prevalent medical and media discourse around the bleak state of African American health and eating practices.

Instead of focusing only on how African Americans are culturally *distinct*, the participants in one of my focus groups discussed how African American eating and health was *similar* to other races. For example, they discussed the similarity of African American and Latino foods by noting that both groups commonly use pork in their dishes. Also, part of what I talked to participants about was their reaction to the discourse (in the media and other venues) around African American health disparities. They responded by expressing how frustrated they were because they felt that African Americans were being unfairly singled out as being worse off than others. T3 put it this way,

> "We are not carryin' all this [disease] by ourself. God did not create for us to have all this by ourself."

Similarly, T2 also talked about disease being pervasive across races, not localized in the African-American community:

> "Nobody healthy. I don't believe in that. I don't believe nobody healthy. I don't care what color it is, black, white, purple, blue or what. You not healthy… I'm tired of this Black, White thing – blue, purple thing. All of us got it – everybody got it."

Along the same lines, T1 spoke specifically about how a lot of Caucasians "got sugar too" (speaking of diabetes). In saying this, he reacted against the idea that African Americans are much worse off than the rest of the population. T2 also expressed her frustration by saying,

> "I even get frustrated on television when I see something, where they say Blacks [have problems]. Why is it always got to be Blacks? What make them think Black dominate just the low, the lowest of all?"

T1 and T3 agreed with this sentiment, saying that Blacks were the recipients of undue negative attention.

While all participants did not express these views, they are such delicate and important concerns that I tried to be very sensitive to them in the work that followed this formative research. Indeed, my results echo those found in previous research, which has shown the importance of designing health interventions that account for African Americans' concerns over how they are portrayed in the media (Karanja 2002). My findings help further answer RQ1 by highlighting the fact that when addressing the health issues of a particular cultural group it is important not to overemphasize how they are different from other groups. In particular, when addressing groups with health disparities, overemphasizing their differences may lead that group to feel negatively singled out.

3.3.4 Summary of Answers to RQ1

In summary, the results I described in the previous sections answer RQ1 in the following way:

- *With what aspects of nutrition are individuals in low-income African American communities most interested in receiving support?*
    - Participants were most interested in receiving technological support for learning new strategies for healthy eating.
- *What socio-cultural considerations should be made when providing this type of support?*
    - This study highlighted three important socio-cultural considerations that guided my subsequent research:

1. Users may face serious economic and environmental challenges to eating well (*e.g.,* affording and locating healthy foods in their neighborhoods).

2. Allowing users to share their healthy eating experiences with others in their socio-cultural context can be beneficial because they may have a shared sense of common ground (with respect to identifying similar cooking and eating interests and experiences) and can learn from the experiences of their peers.
3. When addressing the health issues of a particular cultural group it is important to not overemphasize how they are different from other groups. In particular when addressing groups with health disparities, overemphasizing their differences may lead that group to feel negatively singled out.

3.4 Design Implications

Based upon my results, I now describe three implications for the design of technology that promotes healthy eating while accounting for the ways in which nutrition-related experiences are affected by socio-cultural factors.

3.4.1 Acknowledge Community Expertise (DI#1)

My participants shared stories about their familial history of health problems and how they personally overcame challenges associated with their socio-economic context. These stories highlight the importance of acknowledging and leveraging the very personal expertise that people have when it comes to trying to eat healthfully within their social and cultural context. That is, given the constraints and affordances of their neighborhoods, my participants faced particular challenges and developed strategies for dealing with them. Thus, my findings highlight the fact that there is a rich resource within these communities that technology designers should consider: the community members themselves. In addition to bringing outside expertise into the community, my results suggest that another promising approach is to harness the expertise that exists currently in the community. My participants brought health disparity statistics to life because their stories were real-world examples of the statistical picture painted by health researchers. At the same time, their stories represented a defiance of those statistics as participants

shared how they rose above adversity to counter the challenges to eating healthfully that they experienced in their neighborhoods.

3.4.2 Support Learning from Community Experience (DI#2)

Looking across the expertise and experience of my participants, it is clear that there exists a culturally situated knowledge base of trying to eat healthfully. My focus groups showed the ease with which people shared this expertise and found common ground through the experiences that arose out of their shared socio-cultural context. This then suggests that a promising design direction would be to leverage this distributed expertise. This implication, coupled with the interest participants showed in learning strategies for eating healthfully, suggests the promise of designing community-oriented systems for gathering culturally and locally relevant healthy strategies. By culturally relevant, I mean reflecting the distinctive culture of eating in low-income African American communities. By locally relevant I mean reflecting the constraints and resources for healthy eating in the neighborhoods that users live in and frequent (as opposed to various online communities which serve to connect geographically distributed individuals (Maloney-Krichmar and Preece 2005; Salem, Bogat and Reid 1997)). For example, with regard to my participants, some of the particular issues that were important to them were finding affordable and healthy foods given the lack of options in their neighborhoods.

3.4.3 Account for Uniqueness without Alienating (DI#3)

While it is important to appreciate the uniqueness of a culture, my results showed the sensitivity required in doing so. That is, some of my participants were frustrated with what they saw as an unfair portrayal of the state of health within the African American community. They argued that by emphasizing the significant health disparities that exist, others were creating a negative image of their culture. Thus, when designing future tools, it is important to account for the uniqueness of a culture (as numerous health researchers have pointed out) while simultaneously taking care to not alienate that group by overemphasizing the ways in which they experience more severe health issues. Doing so

requires a design subtlety in which this balance is struck, something that is critical to developing systems that are well received by potential end-users.

3.5 Summary

Through focus groups and participatory design sessions, I determined valuable design implications for my subsequent research. These guidelines reflect the construct of collectivism because they advocate harnessing the strengths of a community through collaborative health promotion (through experience sharing) in a culturally sensitive manner.

CHAPTER 4

EATWELL: DESIGN & EVALUATION

Based on the results of the formative fieldwork described in the previous chapter, I designed and implemented EatWell, a system that helps people learn culturally relevant strategies for healthy eating. EatWell allows users to create short audio memories describing how they have tried to eat healthfully in their neighborhood (*e.g.,* at fast food restaurants or when cooking at home) and listen to the memories that others in their local community have created (Grimes 2010; Grimes, Landry and Grinter 2010; Grimes et al. 2008). The system design thus leverages the existing culturally and locally situated knowledge of the community, and as such helps individuals gather relevant strategies for healthy eating. In the following sections I describe my design rationale and system design in more detail, my methodology for studying the impact of EatWell and my results. I conclude with design implications for future work on health information sharing applications.

4.1 Design Rationale

I chose to build a cell phone application because the penetration rate of this computational device is high even in low-income communities. A 2005 Consumer Electronics Association Report survey showed that 74% of respondents with household incomes less than $25K/yr owned cell phones (CEA 2005). Once I identified a device platform, I examined how to design an application that reflects the cultural construct of collectivism. In Chapter 2, I described the lay health advisor (LHA) model as one approach to collectivist health interventions. EatWell reflects one of the main goals of this model: by sharing and helping others learn from their healthy eating experiences, community members take active role in improving the health of the community.

4.1.1 Incorporating Fieldwork Design Principles

My initial fieldwork results showed that in terms of receiving technological support for nutritional wellness, participants were most interested in learning new strategies for healthy eating. I designed EatWell to be a system that provides this type of

support and examined the effectiveness and impact of my approach. In this section I describe how I addressed each of the design implications that arose out of my fieldwork (Chapter 3).

First, I acknowledged community expertise (DI#1) by designing EatWell to be a repository of information and making community members the sole creators of content within the system. I did not seed EatWell with stories about eating healthfully or tips taken from outside sources. Such an approach may have been useful, but my fieldwork showed the promise of privileging the rich experiences of community members in my design. Furthermore, I supported individuals in learning from community experience (DI#2) by creating a mechanism whereby users' stories were accessible by other system users, all of whom lived in or frequented the same neighborhoods. By having access to the stories of others in one's neighborhood, EatWell supported individuals in gathering strategies for healthy eating from individuals who likely faced similar challenges and who had a similar cultural frame of reference.

Finally, I accounted for the uniqueness of the particular culture I was working within while attempting not to overemphasize the health disparity issues that exist (DI#3). By constraining the user group to African Americans who lived or spent a significant amount of time within a set of low-income neighborhoods, I acknowledged that there might be a unique set of issues and experiences that these individuals could speak to. At the same time, by making the categories of stories that individuals could create generic (*e.g.,* "Cooking at Home" and "Restaurants"), I did not force them to share stories relating to any specific health issue. Designing culturally relevant systems without making gross generalizations about a group of people is an important and related concern. I attempted to address this issue by designing EatWell such that it is open-ended enough to allow users to infuse it with stories that reflect their own cultural experience.

4.2 System Description

I now describe EatWell in more detail, including the user interaction and technical implementation of the system.

4.2.1 User Interaction

Users access EatWell by using their cell phone to dial a number that connects them to the EatWell service. They are greeted by the following voice message: "Welcome to EatWell. You can listen to or record memories about eating healthfully in your neighborhood. Please choose what kind of memory you want to listen to or create." The user then chooses from the five categories of memories: (1) Fast Food, (2) Restaurants, (3) Cooking at Home, (4) Grocery Stores & Markets, and (5) Other. Once the user chooses a category (by selecting the corresponding button on their cell phone keypad, 1 to 5), they are told that they can press (1) to listen to a memory or (2) to record their own. If they choose to record a memory, they are told to speak their memory into the phone after the tone. Once they have finished recording their memory they can hear it played back and then keep it, re-record it, or delete it.

Once a memory is recorded it is immediately available to be listened to by anyone using the system. If a user chooses to listen to existing memories, the newest memory is played first. The user can listen to the other memories created by pressing the appropriate keypad button to go to the next memory or the previous memory. All memories are played in reverse chronological order (newest to oldest). At any time, users can leave the memory category that they are in to listen to or record memories in a different category.

4.2.2 Technical Implementation

To develop EatWell, I used the TellMe Studio suite of tools for creating voice-based applications, VoiceXML and PHP. I stored memory information (*e.g.,* file locations) and user-interaction information (*e.g.,* memories listened to and created by each user) in an SQL database. All of this code was stored server-side, so no software was installed on the user's phone. To access EatWell, users only need to use their existing cell phone and service plan to dial the number to reach the system.

4.3 Method

I evaluated the use and impact of EatWell in an urban Atlanta, GA neighborhood in a field study with 12 people (Grimes et al. 2008). At the beginning of the study, I showed participants how to use EatWell and then asked them to complete a survey with

questions related to three topics: demographics, nutrition-related attitudes and practices, and cell phone usage. Each participant had access to EatWell for at least four weeks and during this time I logged how they used the system (*e.g.*, date and time of access, what memories they listened to). In addition, I interviewed each participant one to two times to gain deeper insight into how and why they used EatWell (See Appendices B.1 and B.2). (My goal was to interview all participants twice, but due to scheduling conflicts, three participants did not complete their second interview.) In the interviews I covered a number of topics, including what motivated participants to create and listen to memories, their reactions to hearing memories, what they considered to be positive and negative aspects of the system, and the extent to which they had tried strategies that they heard in EatWell. The data gathered in these interviews allowed me to answer RQ2 and gain initial insight into RQ3.

While I suggested that participants use the system at least once or twice a week, I encouraged them to use it however much they wanted to. I gave participants this freedom because I was interested in examining what level of interaction was reasonable for this type of information sharing application. Furthermore, I decided not to seed EatWell with example clips because I did not want to lead participants to create a particular type of memory. Rather, I was interested in what they would share on their own, without too much leading from me. To further emphasize the freedom that participants had in creating content, I advised them that they could talk about anything related to nutrition that they liked.

I recruited all participants at a YMCA[10] branch in a low-income, predominantly African American neighborhood in Atlanta. I used flyers to advertise the study and verbally described the study to individuals coming in and out of the YMCA. This branch is located in a community where the estimated median household income is 35% lower than the state average[11]. Since the YMCA offers a number of health-related programs and facilities, I felt that recruiting there would help me to recruit participants that had some

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[10] The YMCA is a non-profit organization that provides numerous health-related services to local communities, including wellness programs and exercise facilities.
[11] http://www.city-data.com/zips/30311.html

interest in healthy living. In addition, as the YMCA is an organization that serves local communities, recruiting there helped me to obtain participants who lived or worked in the same general area. Since I designed EatWell to help people share and gather strategies for eating healthfully in the neighborhoods that they frequent, it was important that I recruit participants who shared a common geographic frame of reference. Participants received a $20 gift card for participating in the study.

4.3.1 Analysis

I conducted a thematic, inductive analysis of the interview transcripts (Thomas 2006). I led the analysis of this data and with the help of a research assistant we first examined the transcripts to derive a set of codes that described the emergent phenomena in the data (similar to the approach used in Grounded Theory data analysis (Strauss and Corbin 1990)). I then met with my research assistant to review the codes and reach consensus. Once the final set of codes was extracted from the interview data, we came together to iteratively cluster these codes and arrive at higher-level themes.

I also conducted a content analysis of participants' audio clips with a research partner. I led this analysis process by developing a set of codes based on themes that emerged from the interviews and an initial examination of the clips. I created a set of codes that allowed me to analyze the extent to which clips were culturally and locally focused (Grimes, Landry and Grinter 2010). To ensure consistent coding between my research partner and myself, we first met to review the proposed coding protocol and discuss how the codes would be applied. We then randomly selected a subset of the 38 EatWell audio clips (20% ≈ 8 clips) to rate. Each rater then independently coded these sample clips by listening to the audio and reading the transcript of each clip. We coded the transcripts at the sentence level, meaning we looked for the presence or absence of each code in every sentence in each audio clip.

We computed Kohen's Kappa (k) statistic to determine the agreement between my research partner and myself (Bernard 2002). We made 560 observations (8 clips x 35 codes x 2 raters) and we computed the agreement to be $k = 0.83$. Researchers have established that 0.70 or more is considered an acceptable k value (Landis and Koch

1977). After establishing this considerable agreement, we randomly divided the 38 clips (19 clips were analyzed by each rater) and analyzed the complete dataset.

Finally, in addition to analyzing the interview data, I examined the system usage logs to determine the frequency and nature of participants' interactions with EatWell.

4.4 Participant Overview

Twelve people participated in this study: four male and eight female. Most participants were over 30 years old, though participants came from a range of age groups (18-54 years old). Four participants were married and eight had children. All had access to a cell phone, most used a cell phone three or more times per day, and they varied in how often they left and listened to voicemail messages (from a few times each week to multiple times a day).

In terms of their previous nutrition-related behaviors, eleven participants had previously taken foods out of their diet and eight had experience introducing foods into their diet. These findings show that my participants had a history of changing their diet, and this in turn suggested that they would have a set of experiences to speak about when creating memories in EatWell. In addition, seven participants indicated that they were unsatisfied with their current eating habits and all twelve participants wanted to learn how to make changes to their current habits. Together, these attitudes suggested that participants might be particularly interested in a system like EatWell as it allows users to learn from the healthy eating strategies of others.

4.5 Results

I now describe the results of my evaluation of EatWell (Grimes, Landry and Grinter 2010; Grimes et al. 2008). I begin by giving an overview of how people used the system. I then detail the nature of the content in EatWell, including the personal and positive stories that users shared, the emotional quality of these stories and the identification that users felt with one another. I then describe the extent to which stories contained locally and culturally focused information and discuss the sense of community empowerment that EatWell users felt. I conclude with a discussion of some of the challenges that EatWell users faced.

4.5.1 Overview of System Use

Overall, participants enjoyed being able to create and listen to memories in EatWell. They liked having the opportunity to share their favorite recipes, restaurants, and nutrition tips with others. In fact, only one participant said that she would not use a system like EatWell in the future. P13, for example, was excited to share the expertise that he had developed through his 30 years of experience with trying to eat healthfully. Table 1 shows examples of memories that participants created.

In addition to creating memories, participants enjoyed listening to memories, in part because they contained useful ideas for healthy eating in their neighborhoods. For example, some people gained new ideas for restaurants to try and others were reminded of places they had gone to in the past or had not yet had the chance to try. Participants also gained strategies for eating healthfully at home, for example, they heard others speaking about new recipes and snacking in moderation. Not only did participants hear these strategies, but four people also noted that they gave them a try and eight people planned to do so in the future.

During this study, participants created 38 memories that were relatively short: on average they were 52s in duration (min=16s, max=130s). Participants varied in the number of messages they created, from 2 messages to 10. Overall, memories were listened to 107 times during the study, and the number of messages each participant listened to varied greatly. The most popular category, both for creating and listening to memories was “Cooking at Home” (memories created=13, memory accesses=42). The second most popular category was “Fast Food” (memories created=11, memory accesses=31). My interview data further supported this popularity ranking: when I asked participants in which category they were most interested in creating memories, most said Cooking at Home, and the second most mentioned category was Fast Food. Over the course of the study, participants accessed EatWell an average of five times (min=2, max=8), listened to nine memories (min=2, max=38), and created three memories (min=1, max=10).

Table 1. Examples of EatWell memories, by category.

Restaurants	I'm calling particularly about a restaurant that's called Up the Creek. Up the Creek, when um choosing your restaurants, um in terms of your diet and also things that you may or may not want to eat it's also important sometimes to understand their seasonings that they may use on their foods. Um, I particularly had fish that was grilled and this particular restaurant which was Up the Creek, which I do recommend, has a Cajun style of tilapia fish which was very tasteful and uh, I certainly recommend it. – P13
Fast Food	Hi um, I heard the gentleman talking about the fast food Burger King veggie burger. So I just went by there 'cause I hadn't had anything to eat before I went to work. And I actually enjoyed the veggie burger. And it was very cheap. And actually, I went back to the fast food place and got another veggie burger but that's another story. But it's actually real good, and it's an experience. I let my girlfriend try it and she loved it too. So I recommend the veggie burger from Burger King. I got it from 2 different burger kings so that means it's at every burger king. So, I just wanted to share my experience. Thank you. – P2
Cooking at Home	I have a great memory for a lentil loaf. I actually got it off the food network. That Italian cook, the one they say is so sexy, did a lentil loaf. So it's like meatloaf only it's made with lentils! And it is *absolutely* fabulous! It took me a long time to make it the first time. Um, and I actually as I was making it I said, 'I am never doing this again 'cause it's just too much trouble.' In reality it's not that much trouble but you just gotta remember to soak the lentils like a day ahead of time. It is *so good* that my daughter who is 4 and a half wanted to take it for lunch the next day *and* asked if we had any extra to take to her teacher. Now you know it must be really tasty. Good and good for you! I also gave the recipe to a friend of mine who is vegetarian. She said she has made that lentil loaf 5 times since I gave it to her. So, give it a try. –P3
Grocery Stores & Markets	Greetings. This morning I am making a run to the Dekalb farmer's market. And it's unfortunate because I really enjoy the prices that I gather there, however it's clearly on the other side of town (I live in Southwest Atlanta, 30 or so minutes away). So I have to kind of strategize and do it in conjunction with trips to Walmart or other places to make it worthwhile to drive. But the produce is very fresh and the cost of the produce is very affordable, so in instances it's worth my while to make that drive all the way tot he Dekalb Farmers' market. So if you don't know about that place definitely look it up – you can basically get produce from the entire world and under one roof. So the international market is a pretty good deal. Thanks, take care, bye. –P4

4.5.2 Personal, Positive Stories

My analysis of the interview data yielded a set of themes that describe the rich, personal stories that participants crafted. These themes provide an answer to RQ2, that is, *what factors lead people to feel engaged with commentary that community members share about eating healthfully*?

First, participants created audio clips that were not just impersonal facts: many were intimate little stories that provided a window into the storyteller's life. One participant described it this way,

> "Everybody has stories. And [EatWell] reminded me of just the days of old where everybody has a story to tell."

The audio clips in EatWell were intimate because people talked about the ways in which they went through their days, their routines, and the personal victories that they had as they tried to eat healthfully (*e.g.,* learning how to make healthier selections at a local fast food restaurant). Participants also described significant achievements, for example, P12 created a memory in which she discussed how she had lost a great deal of weight. By providing a window into their lives, participants shared part of themselves with the community of EatWell users.

In answer to RQ2, by describing their personal experiences with trying to eat healthfully, participants created content that was particularly useful for and interesting to others in the study. This is in contrast to, for example, EatWell facilitating the sharing of generic and impersonal recommendations for healthy eating. One participant said,

> "Real stories … those are always more effective to me. Once you have gone through it … and you see the before and the after."

Eating strategies that have already been tried and tested are important sources of inspiration as people attempt to build a collection of healthy eating tactics. P4 felt that gathering information from the medical community solely was insufficient, and that learning from the personal experiences of others was valuable:

> "I didn't have the reservations that well, this isn't – this information that I'm gathering isn't from a quote-unquote established medical authority or things of that nature because of my own personal thoughts that the medical establishment doesn't always give you everything you need to know about being able to maintain your own health."

As I examined the interview data and the audio clips created by my participants, it appeared that inviting users to share *memories* shaped the tone of the recordings. (Recall

that when users first enter the EatWell system, they are told that they can "listen to or record *memories* about trying to eat healthfully in [their] neighborhood.") In particular, it became evident that most of the memories contained positive reflections. Indeed, P2 told me,

> "the word 'memories', you know that helps you think of things that you really enjoy."

Not only were the memories positive, but they were also seen as approachable, not condescending or off-putting. For example, P5 said,

> "Even with [the terms] 'comments' or' suggestions', they can be preachy. Maybe with you using 'memories' it is not preachy. It's not overwhelming."

These results point to the importance of the terminology in this type of system. As this application is a platform for helping users create and share content, determining how the system described that content to users proved to be an important design decision.

4.5.3 Feeling Memories: The Role of Emotion

In addition to being intimate, positive, and approachable, another characteristic of the stories in EatWell was their emotive quality. In answer to RQ2, one of the reasons that people felt engaged with the content in EatWell was that it conveyed emotion and personality. My results showed that users were able to express emotion in their stories in part because they *spoke* about their memories. Indeed, one of the strengths of the audio medium is how effectively it helped people to convey emotion and personality. As P1 noted, when one listens to memories in EatWell,

> "You getting to experience they joy, you get to hear the joy in they voice. You can't get the joy in a text."

Similarly, P2 noted that, "with the voice reflections … you really felt what they were saying." Participants described how they enjoyed hearing the excitement, pride, and joy in the voice of the storytellers in EatWell. Similarly, participants enjoyed hearing the storytellers' personalities come out in the audio recordings as they spoke about their experiences. For example, P12 said,

> "You definitely found out a lot about the person's personality. Um, it gave you a personal touch when they, you know, talk, and they leave a message. Rather than an email? Oh yeah absolutely. You never get a chance to find out what they even sound like, you know, if you're [reading] an email!"

This emotive quality helped give life to the stories. Furthermore, my results suggest that participants felt these qualities would not have come out as much if they had shared their experiences textually.

4.5.4 Identifying with Memory Creators

It was interesting to see that my participants felt that they could identify with the people creating memories in EatWell, even though they were, for the most part, strangers. Indeed, participants felt this sense of identification in the absence of relationship building tools such as usernames, avatars, and profiles. For example, P12 described the sense of community she felt:

> "People calling in, sharing their experiences … it felt kinda like a family. It felt like a family to me."

Furthermore, in answer to RQ2, hearing the stories of people who lived in the same community was part of what made EatWell memories valuable for some participants. For example, P4 said,

> "I like the … fact that the people who were leaving the messages were living in my own community. I liked that idea because there's a common connection, and probably in most cases a common situation of trying to deal with some of the same issues."

Finding that my participants felt a sense of identification with other EatWell users is important because previous research has shown that when the receiver of a health message sees the message creator to be similar to him or herself they are more prone to like the source (Kreuter and McClure 2004).

In summary, in answer to RQ2, my results show that there were three main reasons why participants felt engaged with the content in EatWell, that is, why they were interested in listening to it. First, the memories described personal experiences rather than, for example, generic healthy eating guidelines. Second, the memories expressed the emotion and personality of the storytellers. Third, some participants liked the content in EatWell because they felt they could identify with the other users because they lived in their local community.

4.5.5 Culturally and Locally-Focused Information

One of my goals in designing EatWell was to help users share healthy eating ideas that reflect their socio-cultural context. Through a content analysis of the EatWell

memories, I examined to what extent users discussed information that was culturally and locally focused (Grimes, Landry and Grinter 2010). Specifically, I looked for the existence of the following codes:

- *Geographical directions* – applied if the clip contained directions (*e.g.,* "Take I-75 and get off on Exit 242").
- *Street names* – applied if the clip described street names or highways where listeners could locate particular establishments.
- *Local establishments* – applied when clips mentioned the names of local grocery stores, restaurants or other businesses.
- *Cultural foods* – applied when clips mentioned foods that are typically associated with the African-American soul food cuisine.

My results showed that in 47% of the clips, users spoke about specific local businesses such as grocery stores and restaurants. When I excluded clips from the Cooking at Home category, I found that an even larger percentage of clips (72%) described specific establishments. Interestingly, I also found that only 25% of all clips (excluding Cooking at Home) included street names and/or geographical directions, which could help listeners find the places that were being recommended. One explanation for this finding is that content creators may have thought listeners would know where the businesses were located because they were from the same community. Alternatively, content creators may have simply neglected to provide enough information. In Chapter 6, I describe how I further examined the level of detail that users desire in an application that supports the sharing of one's healthy eating ideas.

In addition to local food establishments, I examined how often users described preparing or consuming traditional African American cultural dishes. For example, in the following clip transcript, a participant discussed collard greens, a staple soul food dish:

> "One thing that someone – my aunt – just hipped us to [that is, informed us about,] over Thanksgiving holiday that we haven't yet to try but we're gonna try is she uses her crockpot to do collards, for her greens. Because greens, you know, take a long time to cook. So my wife is talking about trying that with her greens, and using the crockpot for that."

However, my results showed that in the majority of clips, rather than discuss soul food, participants more frequently spoke about more general American foods (*e.g.,* steamed vegetables and fruit smoothies). I found that only 5% of EatWell clips discussed cultural

foods. This result contrasts the findings of Donelle and Hoffman-Goetz, who found that members of an online health forum for Aboriginal Canadians expressed their cultural uniqueness (*e.g.,* as it relates to health traditions and rituals) in the messages they posted (Donelle and Hoffman-Goetz 2008). I examine the presence of such cultural uniqueness further in my study of Community Mosaic (Chapter 6).

4.5.6 Community Empowerment

Another emergent theme in my analysis of the interview data was how EatWell memories facilitated felt a sense of community empowerment: participants felt that the stories inspired a feeling of hope in the face of the extreme health disparities that exist in their neighborhoods and helped them to see that community members were collectively working to improve their health.

Sharing Memories, Sharing Hope

One of the most interesting findings in this study was not simply that EatWell helped users to share useful content, but that in the sharing of that content they were spreading a sense of hope. This sense of hope was facilitated as people saw that there were others in their community who were trying to eat healthfully. For example, P12 said,

> "I mean it definitely was a plus to hear that so many African Americans are moving into eating well. I mean it just gave me hope." Similarly P4 said, "There are times where when you look at the predominance of unhealthy living and lifestyles, that you can become a little disenchanted…[But EatWell helped me see that there is] a little sub-grouping of a few people who seem to also be genuinely looking for ways to become healthy."

Thus some participants were encouraged by seeing that even though their community is affected by serious health concerns, there were people who were attempting to eat healthfully.

These findings provide initial insight into RQ3 (*In what ways does accessing the health commentary of local community members affect how people conceive of the health of their community?),* and show why this is an interesting question to ask. The excitement and encouragement that people felt after hearing that others in the community were trying to eat healthfully suggests that their perception of the health of the community may have been improved. As I discussed above, one reason for this may be the fact that some

participants said they felt that the content shared in EatWell was mostly positive. While, I did not directly examine this research question in the EatWell study, my findings suggest that it is an interesting question to examine further. In Chapters 5 I describe the design of Community Mosaic and in Chapter 6 I detail the ways in which using it affected how study participants conceived of the health of their community.

A Sense of Collective Effort

My participants were also encouraged by the collective effort that was exemplified in EatWell as people tried to help others by sharing their experiences with trying to eat healthfully. P4 said,

> "I like the idea that we can collectively improve our health by having a means of exposing or exchanging [information]."

Similarly, P13 said,

> "It stimulated me to know that there is other people out there that wanna share what they [eat] and what they do and share it with others that have problems … and teach other people how to be healthier in their eating habits."

Some participants said they were specifically excited that EatWell users could work together to improve the state of health in the African American community. For example, P12 felt EatWell was beneficial because it was a platform for,

> "sharing ideas on how we as a [cultural group]… definitely showing how Black people can eat better and how we can share our ideas to help the next person with, you know their lifestyle… you know them having a problem with diabetes, high blood pressure, this that and the other."

These results show that people were excited to see that others were working together to collectively improve the health of the community. However, I did not gain insight into how much people felt that they were *personally* helping to improve the health of their community by sharing their experiences. People spoke about what *others* were doing or what the *group* was doing. In my study of Community Mosaic, I further examined this topic and in so doing answered RQ4 by studying how technology can help individuals feel that *they themselves can improve* and *are improving* the state of health in their community.

4.5.7 Challenges in Creating Memories

While participants enjoyed using the system, they did face some challenges as they created their audio clips. These challenges included making their memories

understandable and knowing what kinds of stories would be well received by others. First, since users were creating audio recordings, most said that they took steps to make sure their point came across clearly. For example, P2 said that she wrote her memories out beforehand so that she would not say a lot of "ums" and "ahs" when she recorded her memory. Other participants revised memories that they thought were hard to understand by using EatWell's re-record feature. P5, for example, listened to a memory that she had just created and decided that she was speaking too slowly. She then re-recorded that memory to increase the speed of her speech. These examples show that participants were concerned about their points coming across clearly, which meant that they had to pay attention to the clarity of the audio recordings that they created.

Participants were not only concerned with how articulate their memories were, but also that their memories would be perceived as useful and interesting to other EatWell users. One participant noted, for example, that she was planning to leave a memory but then decided not to when she realized that there was already a similar memory in the system. This participant felt that having duplicated content would be a negative thing. Another participant said that she was sometimes unsure of what memories to leave because she did not have a good sense of what people would find interesting. P12 had a similar concern, saying that she found the existing memories so impressive that she felt that she had to live up to that standard:

> "I need to make sure I have a warm and wonderful experience like everyone else so they'll be interested in listening to my message."

In the end, this pressure was part of what kept her from recording more memories. These findings show the importance of helping users feel that the content they are creating is useful and valued because not doing so may deter them from contributing to the system. EatWell was designed to have a simple interface, and indeed, having voice and keypad interaction only (as opposed to a graphical interface) was a design constraint. In Chapter 5, I discuss the design of Community Mosaic, a health information sharing system that allows users to get feedback on the content they share.

4.5.8 Summary: Answering RQs

In summary, my results from the EatWell study answer RQ2 and provide initial insight into why RQ3 and RQ4 are interesting questions to ask:

- RQ2
    - There are three main reasons why participants felt engaged with the content in EatWell, that is, why they were interested in listening to it. First, the EatWell clips described personal experiences rather than just focusing on generic healthy eating guidelines. Second, the memories expressed the emotion and personality of the storytellers. Third, some participants felt a sense of identification with other EatWell users.
- RQ3
    - The excitement and encouragement that people felt after hearing that others in the community were trying to eat healthfully suggests that their perception of the health of the community may have been improved. I did not examine this question directly in the EatWell study. My results from the Community Mosaic provide more insight into this question.
- RQ4
    - My participants were excited to see that others were working to collectively improve the health of the community. However I did not gain insight into how much people felt that they were *personally* helping to improve the health of their community by sharing their experiences. In the Community Mosaic study I directly answer RQ4 by looking more deeply at what people feel their personal role is in affecting the health of the community.

4.6 Design Implications

Based on the findings that I discussed in the previous section, I identified design implications for future health information sharing systems targeted at low-income African American communities. These implications help to answer my overarching research question, "*How can we incorporate the cultural construct of collectivism into the design of health technologies for low-income African American communities, and what are the implications of doing so?"* These implications include 1) the value of supporting people in conveying personality and emotion in these memories and 2) the

importance of creating deeply local health applications that reflect the cultural and geographic frame of reference of communities.

4.6.1 Account for the Importance of Emotion (EW#1)

The medium of voice proved to be particularly useful because it helped people to convey the emotion associated with their experiences. Memories conveyed the joy people felt as they remembered preparing healthy yet pleasurable foods. This emotion was part of what kept people engaged with the content in EatWell and suggests the importance of facilitating such expressiveness in future systems.

4.6.2 Design Deeply Local Health Applications (EW#2)

Another important aspect of EatWell was the fact that it was designed to support the sharing of experiences amongst individuals in a common geographic and cultural context. Doing so helped people to gain information that was useful and practical. Furthermore, EatWell helped to facilitate a sense of collective effort, an important finding given that my goal was to design a system that appreciated the importance of collectivism in African-American health (a cultural construct that values communal responsibility). The results of my study thus highlight the benefit of creating what I call *deeply local health applications*, systems that are designed for individuals with a common cultural and geographic frame of reference (Grimes et al. 2008). While previous research has shown how online health communities bring people from all over the world together (Salem, Bogat and Reid 1997), EatWell has shown the benefit of a virtual health community that connects people in local settings. Through the design of Community Mosaic I was able to further examine the benefits and challenges of creating deeply local health applications for African Americans in low-income communities.

CHAPTER 5

COMMUNITY MOSAIC FORMATIVE EVALUATION & DESIGN

I designed a second system to more deeply explore the impact that an application rooted in the concept of collectivism can have on the nutrition-related attitudes and behaviors of a local community. While I derived general design guidelines in my first study (described in Chapter 3), it was important for me to conduct another formative study to gain more specific guidelines for the particular group of people that I was focusing on in this part of my research: members and staff at an Atlanta, GA YMCA branch (the same site where I recruited participants for my EatWell study). As I mentioned in the last chapter, because the YMCA is a community-focused organization, it attracts individuals who live, work or spend time in the same geographic area. Thus, recruiting members and staff from the YMCA helped me identify participants who are familiar with and impacted by the resources for and barriers to eating healthfully in the same general geographic area.

I conducted a formative study to determine how the patrons and staff of the YMCA felt healthy eating could best be encouraged in the surrounding neighborhoods. Furthermore, I examined the viability of designing a system for use at this particular branch. By conducting focus groups with people that frequent this particular branch and using their responses to ground my design, my goal was to create a system that meets the needs and desires of my user group. Ultimately, the resulting system, Community Mosaic reflects the design implications derived in my initial work (discussed in Chapter 3) as well as the focus groups I conducted at the YMCA.

In this chapter I describe the iterative design process that I carried out to develop Community Mosaic, including the formative focus groups that I conducted, the design implications that I derived and how I translated those guidelines into the Community Mosaic system design. I then describe the HCI expert evaluation and pilot deployment that I conducted, which helped me refine the system design.

5.1 Formative Evaluation: YMCA Focus Groups

5.1.1 Method

My formative study was based in a predominantly African American, low-income community in Atlanta (the estimated median annual household income in 2009 was 35% below the state average of $47,590). Compared to other Atlanta YMCA branches, this particular location serves a high number of low-income residents. I recruited participants by placing flyers in the YMCA and making announcements during exercise classes. 31 people participated in the study (23 female, 8 male) and they were between 18 and 60 years old. Twelve participants were married and 21 had children. Twenty-six participants reported their income levels and household size, and of them, 27% (n=7) had a household income that was less than or equal to 235% of the 2009 federal poverty guidelines[12] (metrics used to determine individuals' eligibility for various federal aid programs). The remaining participants had annual household incomes that ranged from $40k to over $100k. Thus, while the community setting I targeted was predominantly low-income, my participants did reflect a mix of socioeconomic statuses. Most had a post-high school degree (n=26) and they had a range of occupations including attorney, event coordinator, hairstylist, teacher and tutor. Eight participants worked at the YMCA.

I conducted seven hour-long sessions at the YMCA consisting of three to six participants (see Figure 3). Once at the session, participants completed a short survey with basic demographic questions and specific questions about their YMCA visits (*e.g.,* how frequently they go to the YMCA and the nature of these visits). Next, I asked participants to discuss their thoughts on the state of health in their community, including the barriers to and resources for eating well (see Appendix C.1 for the focus group guide). I then presented each participant with 13 note cards (described and listed in Table 2). Each card contained an idea for how technology could help the community encourage healthy eating amongst residents. By having each card focus on a community-oriented strategy, I was able to obtain participants' reactions to a variety of approaches that reflect

[12] http://aspe.hhs.gov/poverty/09poverty.shtml

Figure 3. Formative focus group session.

the concept of collectivism (*i.e.,* they indicate ways in which the community can work together to improve its wellbeing). My goal was that these cards would help spark discussion, not represent an exhaustive list of all potential strategies. Participants were asked to look at all of the ideas and choose three cards with ideas that they felt would be most effective and three that would be the least effective. (They could also take a blank note card and write their own idea.) Once their decisions were made, each participant described the rationale behind their choices, and this activity served as the basis for further group discussion. Participants received a $15 gift card for participating in the study.

I tallied the responses to determine how many people felt each card's approach was effective or ineffective. I then computed the ratio of the total number of people who felt the idea was effective to the number who felt it was ineffective (see Table 2). This ratio provides a general sense of the overall response to the card: a larger ratio indicates that participants felt more positively towards the idea than negatively and a ratio under 1

Table 2. Formative focus group card topics and results. The 13 ideas for community-based health promotion presented to my participants, including a description, the # of people who said it would be an effective (E) and ineffective (I) idea, and the ratio of E:I (R). Ideas are color coded to show the most popular (dark green), marginally popular (light green), those with a more balanced reaction (white), those that were marginally unpopular (pink) and ideas that were most unpopular (red).

CARD TOPICS
Cultural Cooking Tips: Allowing community members to share their ideas for preparing traditional African American "soul food" dishes more healthfully: *E:15, I:1, R: 15.00*
Showcase Community Resources: Discussing the things in the community that can help people eat more healthfully (*e.g.,* sources for inexpensive vegetables): *E: 13, I: 3, R: 4.33*
Exposure to New Healthy Recipes: Allowing community members to share their ideas for preparing healthy dishes in a variety of cuisines: *E: 11, I: 4, R: 2.75*
Alternatives for Cheaper, Healthier Groceries: Allowing community members to share what items they feel work for them in terms of healthiness and cost. *E: 8, I: 4, R: 2.00*
Healthy Fast Food Recommendations: Allowing community members to share their ideas for finding healthy fast food: *E: 11, I: 7, R: 1.57*
Awareness: Showing why eating healthfully is important (*e.g.,* increased awareness of diet-related diseases): *E: 15, I: 10, R: 1.50*
Community Advocacy: Help people advocate for healthier food options in the community (*e.g.,* at grocery stores and restaurants): *E: 8, I:6, R: 1.33*
Community Praise: Allowing community members to see the success stories of people who are now eating more healthfully and give them praise: *E: 5, I: 6, R: 0.83*
Community Encouragement: Putting community members in touch so that they can encourage one another through their personal nutrition-related challenges: *E: 5, I: 8, R: 0.63*
Showing How Healthy the Community is: Helping people to see how healthy or unhealthy the community is as a whole (with respect to eating habits): *E: 4, I: 13, R: 0.31*
Community Feedback: Helping community members get feedback from one another on the healthiness of their eating habits: *E: 1, I: 7, R: 0.14*
Peer Nutrition Advice: Allowing community members to share their general nutrition tips: *E: 1, I: 9, R: 0.11*
Surfacing Community Issues: Discussing the barriers to eating healthfully in the community: *E: 1, I: 14, R: 0.07*

shows that people felt more negatively than positively towards the idea. (As no card contained 0 people who felt it was ineffective, I did not run the risk of having a ratio with 0 in the denominator.) I also audio-recorded and transcribed the focus group sessions and conducted an inductive analysis (Thomas 2006) of participants' explanations for the cards that they chose. This analysis provides insight into why participants felt each idea was effective or not and their broader feelings about the capacity of the community to come together to promote healthy eating.

5.1.2 Community Center Usage

Most participants said that they go to the YMCA a few times a week (n=19); others said that they go almost every day (n=9, though many of these people were staff members) and a few went once a week (n=3). All participants go to the YMCA to exercise and 12 go to see friends or socialize with others, meaning that socializing was not something that most people currently did at the YMCA. This last point was important to know as I designed Community Mosaic, in terms of assessing how reasonable it was to have the system require people to socialize with others around the device. Only two participants said that they go to the YMCA to learn about healthy living or gain information about health services. This last point is important because, as I will discuss later, most participants felt that a key way for the community to improve its health was obtaining more information about healthy eating resources and cooking tips. Thus, from the perspective of my participants, the YMCA was not currently a venue through which this important community need was being filled. It is because of this gap that I saw even more value in designing Community Mosaic.

5.1.3 Card Activity Results

Table 2 shows each card topic in order of its popularity with my participants. Overall, the card that received the most positive reaction was "Cultural Cooking Tips" and the one that participants reacted to the most negatively was "Surfacing Community Issues". The rest of my results highlight the themes that arose across participants' reactions to the various cards, indicating their values towards health and eating as well as their outlook on their community in the context of health. Their comments provide

insight into their feelings about the viability and value of facilitating community interaction around the topic of healthy eating. Furthermore, their comments helped me to answer RQ1[13] by highlighting how these individuals were most interested in receiving support around nutrition. I present my results in two parts; first, I discuss what participants felt were positive forms of community interaction around health (those endeavors that had the potential to actually encourage people towards healthy eating) and then discuss those that they felt were negative (*i.e.,* ineffective at promoting nutrition-related wellness).

Positive Forms of Community Interaction

In answer to RQ1, participants described a variety of ways in which the community could effectively work together to encourage healthy eating. Their feedback can be grouped into three strategies: 1) modifying cultural recipes, 2) identifying locally and temporally relevant healthy eating resources and 3) making success visible. In the following paragraphs I describe why participants advocated each of these strategies.

Modifying Cultural Recipes: I presented participants with the "Cultural Cooking Tips" card to examine how important they felt it was to adapt cultural dishes, as they are often prepared unhealthily (*e.g.,* with high levels of fat and cholesterol) (James 2004). My results show that this is the topic that participants were most excited about (15 said it would be one of the most effective strategies and only one person felt it would not be useful). Many participants felt that *soul food* (traditional African American cuisine that includes dishes such as cornbread, chitterlings and candied yams) is very much valued amongst African Americans, as previous research has shown as well (James 2004). Some felt that soul food is a staple cuisine for numerous African Americans as many were raised eating those dishes. Furthermore, participants felt that it can be hard to stop eating those foods completely because they are often ingrained in one's cultural heritage. Yet, given that these foods are frequently prepared unhealthily, participants voiced the need

[13] RQ1: With what aspects of nutrition are individuals in low-income African American communities most interested in receiving support and what socio-cultural considerations should be made when providing this type of support?

for a change by reinventing recipes in healthy ways. They felt that showing people how to prepare soul food more healthfully would help them see that they do not have to lose the foods that they love to be healthy. For example, P2 said,

> "They are not gonna get your grandma away from eating turnip greens [a soul food dish often prepared with pork fat]. But if you can get her to eat healthier then you know, [she might be] here for another five years."

Locally & Temporally Relevant Resource Identification: Participants also saw value in identifying healthy eating resources that are available locally and that make sense given the time constraints that people often face: overall, both the "Showcase Community Resources" and "Alternatives for Cheaper, Healthier Groceries" cards were viewed as positive ideas. I offered these suggestions because one of the commonly cited reasons for health disparities in low-income communities is the lack of access to healthy foods (Horowitz et al. 2004; Morland et al. 2002). My participants felt that exposing these local resources was critical in part because many people are not aware of local healthy eating options. Furthermore, they said that many residents face economic challenges and that eating well is more difficult in their community than in other parts of the city (*e.g.,* because there tend to be fewer high quality grocery stores). As P16 told me,

> "You gotta [show options for cheaper, healthier groceries] because eating healthy is not expensive when you know there's SUPERMARKET-X down the street or SUPERMARKET-Y or [a] farmer's market, somewhere! We don't have that! So like I said we have to travel to get fresh fruit. I'll take kids on trips that have been shocked at the thunderstorm in the fruit aisle [that is, automatic overhead water shower that hydrates the fruit and vegetables], they love it!!"

P22 further described the necessity of identifying inexpensive ways to eat healthy:

> "Typically the food that's least healthy is least expensive. So if there was a way to get inexpensive, quality vegetables so that they could compete with the inexpensive [local fast food restaurant] burgers, that would be helpful for the community, particularly in this area."

Participants also spoke about the importance of identifying and creating healthy local options when discussing the "Community Advocacy" card. This card presented the idea of helping people advocate for healthier food options in the community (*e.g.*, by requesting they be available at local grocery stores and restaurants). Participants were somewhat divided in their reactions to the card, with eight people saying it would be an effective approach and six feeling that it would not. Some participants felt that people

would not be interested in actually making the effort to engage in such advocacy, for example because they have other problems to worry about. However, others felt advocating for healthier foods in the community (*e.g.*, by making their desires known to the *"powers that be"* [P11] such as local business owners) would effectively make more nutritious options readily available. These participants felt that the availability of more healthy options would make it easier for people to make good dietary choices. Thus, like those that were in favor of the "Showcase Community Resources", these individuals were vocal about the importance of making healthy options more readily available in the community.

In addition to focusing on locally available resources, participants who were in favor of the "Healthy Fast Food" card felt that it is critical to encourage healthy eating by taking into account people's temporal constraints. They said that eating fast food was inevitable because people are busy and fast food is convenient. Thus, these participants indicated that it is important to help people make healthier choices in these establishments. For example, P12 said,

> "That's a huge downfall. It's, it's here on the go, like we were talking about, you're on the go, you need to find something quick to eat and it's a hamburger. But if you're more aware that, they also have salads (and don't drown the salad with salad dressing) at McDonalds… And then there are ways I mean you can get the salad and salad dressing, dip your fork in salad dressing and then you know, then eat salad that way. You share tips like that, that might help."

Participants also described how buying fast food was simply their reality when it came to providing meals for their children in the context of their busy, fast-paced lives. For example, P23 said,

> "Sharing healthy fast food is to me something you have to do because we are all busy and we are all taking our kids to the fast food restaurant. So if you can encourage – I started teaching my daughter to pull the calorie guides out of all the stores 'cause they have them, they have to have them. So I pull them from all the fast food stores we go to and I show her where the lower calorie foods were and I showed her how to take calories off of her food. So my daughter doesn't get hamburgers – and my daughter's a thick girl, this is why I had to teach her this. She doesn't get the hamburger, she gets the chicken sandwich. She doesn't get the mayonnaise on it, I just taught her how to do it better. You're gonna do it anyway, this is how you eat it better."

P31 described her own challenge with providing healthy options for her son in the midst of her hectic schedule,

> "I can always get tips on [getting healthy fast food], I think, with our fast paced way of living, always on the go. [I'm a] single mother trying to take care of her child. [I need to find] healthy options for him because what he eats is gonna affect his growth, his thinking, how he learns, his education. And hopefully it will filter over into his family when he gets older and he becomes a father, he can share those same concepts with his family."

The challenge of making healthy decisions in the midst of a hectic lifestyle was similarly found by Siek *et al.* in their study of low-income caregivers (Siek, LaMarche and Maitland 2009). Their findings led Siek *et al.* to advocate the design of health applications that fit within individuals' busy schedules.

In summary, my participants were eager to gain more information about locating healthy options that fit within their cultural, local and temporal realities.

Making Success Visible: In addition to supporting resource identification, with the "Community Praise" card I examined how participants felt about receiving technological support for 1) seeing the success stories of people who are now eating more healthfully and 2) giving those individuals praise. Participants were practically divided in their reaction to this card, with five people feeling that it would be effective and six feeling that it would not. Participants who felt it would be ineffective were skeptical and unsure of why they should care to see that others were doing well. At the same time, participants who felt it would be an effective approach argued that through the sharing of success stories, people help others to see that it is possible to make positive changes. Thus, participants who reacted positively to the card did so largely because of their excitement at the idea of sharing success stories, *not* providing praise to the story sharers, which was something that few participants discussed as being valuable. They were excited about this idea not because the process of providing praise would be beneficial to the person with the success – instead they felt that seeing the success stories would be encouraging for the viewers. For example, P17 said,

> "You know how a lot times people make excuses and they'll just say, "Oh well I would do it but you know, you know I can't because x, y, z"? I think when you see people that have done it and you know they are in the same situation as you are, they live in the same community as you, they've got the same resources as you. [It's] like okay, now I do have to accept personal responsibility for the fact that I'm not you know doing these things because it can be done and here's a real live example of it, so I think those kinds of things will be helpful."

P27 described how seeing older people living healthfully encouraged and inspired her:

> "You know the other day I was looking on the news – I always got a story. I was looking on the news and this man, he was 100 years old… He did not start exercising until after he retired. So I assume he might have retired at the age of 65 maybe 85 and he started exercising. Never did it before. And he was doing tennis and bowling. And that man looked really, really good for a 100 year old man… That gave me more incentive to want to do something. [I was also encouraged] when I was coming early in the morning to the Y, you would see these older women in here and they started exercising because they had some kind of illness. That's what made them start exercising… Maybe you may be able to encourage people more so that way."

In summary, some participants saw making the healthy eating successes of the community more visible as one way in which the community can be given relevant and inspiring encouragement to eat better.

Negative Forms of Community Interaction

Participants were not enthusiastic about all of the cards that I presented them with: in answer to RQ1, there were certain strategies that participants felt would be ineffective at helping the community to eat more healthfully. Broadly, these strategies fell into the following categories: 1) providing generalized nutrition awareness, 2) identifying issues in the community, 3) sharing general nutrition tips and 4) providing community feedback on eating habits.

Providing Generalized Nutrition Awareness: First, while participants were excited about showcasing the successes of those in the community and pinpointing culturally, locally and temporally relevant resources, they were strongly opposed to the idea of sharing *generalized* health information about the community. For example, the "Showing How Healthy the Community is" card (which encapsulated the idea of helping people to see how healthy or unhealthy the community is as a whole) was mostly rated as negative. Participants did not want an overall picture of the community's health because they felt that people already know this information. They argued that people generally believe the community to be unhealthy but that this has not yet compelled the majority of people towards wellness. P8 had this to say:

> "I think there are so many statistics, so many, you know reports and information [that say,] "Oh our community is unhealthy" … [and] we're still not doing anything about it… we're not alarmed. So I don't think that's the most effective [approach]."

This finding builds upon the results from my first study (Chapter 3) in which participants described being frustrated with discussions of how unhealthy the African American

population is. Those participants expressed frustration with African Americans being singled out as distinctively worse off than other racial groups. In the study currently under discussion, many YMCA members and staff indicated that sharing information about how widespread health problems are within the community was simply an ineffective approach to getting people to eat better.

Similarly, 10 participants said that the "Awareness" card would be ineffective (which suggested showing why eating healthy is important), in large part because they felt that most people are already generally aware of the importance of healthy eating. One can question just how deep and pervasive this awareness is, but the important point to notice here is that a widely held sentiment amongst my participants is that the awareness is there and that there is a desire by some to move past such awareness campaigns. At the same time, 15 participants felt that providing awareness would be beneficial. However, these people indicated that providing more awareness would be beneficial if the information was individualized. They felt that instead of highlighting the general need to eat healthy, it is important to show how real people have been affected by the way they eat and/or provide personalized health information. Taken together, the reactions of those that felt positively and negatively towards providing awareness show that my participants felt that impersonalized information about the state of health in the community or the importance of eating well is not a productive approach. If anything, information about the importance of eating well should be given a personal touch by showing how real people have, practically, eaten well in the past and how others can do so in the future.

Identifying Issues in the Community: I created the "Surfacing Community Issues" card to provide another idea for how low-income communities can address challenges such as locating lean cuts of meats and low-fat milk products (Sloane et al. 2003a). My thinking was that surfacing the issues might help community members identify solutions to these challenges. However, I found that only one person thought discussing community issues was a good idea and 14 people felt that it was an ineffective approach. Participants who were against discussing community issues felt that it is important to stop talking about the problems in the community and instead do something to change the shortcomings. They stated that the community is already aware of the

problems and that talking about them is a negative endeavor that will not help them move forward. For example, P12 said,

> "I think that's more of a negative way of looking at the problem rather than trying to get the people to think positively about changing, just complaining instead of you know moving forward."

Sharing General Nutrition Tips: Participants also reacted negatively to the "Peer Nutrition Advice" card, which suggested that community members provide general nutrition advice to one another (nine said it would be an ineffective approach and only one person thought it would be effective). In online health communities, people often share questions and advice on health conditions with strangers (Maloney-Krichmar and Preece 2005). For this reason, I posed the idea of community residents sharing peer nutrition advice. However, my participants reacted very negatively to this idea. Upon analyzing their reactions, I found that this was mostly because they doubted the trustworthiness of people in their community. Understandably, some participants indicated that they would be wary of peer advice because it is unclear who their information source is. The idea of "advice" implies that the information giver possesses some verifiable truth or medical trustworthiness and some participants did not feel they could guarantee the validity of nutritional advice that community members might share.

Providing Community Feedback on Eating Habits: Similar to the "Peer Nutrition Advice" card, I was motivated to suggest the "Community Feedback" card because of social health applications that let individuals comment on the healthiness of their peers' habits (*e.g.,* (Consolvo 2006)). "Community Feedback" differed from the "Peer Nutrition Advice" card in that it suggested residents provide feedback to one another on their specific eating habits (versus general nutrition advice). However, my results showed that participants felt community members would not care enough to give such critiques. Participants also doubted that hearing such a critique would compel them to change their habits. For example, P22 said that if someone gave her feedback on her eating habits she would think,

> "Thank you for the encouragement but that's just not gonna make me want to eat more healthy. I mean in this time where everything is so quick and we don't have a lot of time – and we're seeing people in passing, I just don't think [someone saying,] 'Yeah you're eating an apple, you go girl!' is gonna work."

5.1.4 Design Implications

Based upon my findings, I derived five design implications that guided my design of Community Mosaic: support personally reflective information sharing, support the sharing of low risk information, make community success visible, bring it back to the individual and support action.

#1 - Support Personally Reflective Information Sharing: First, I found a critical distinction in the type of community-shared information that participants did and did not value. On the one hand, they were excited about increasing the options that people have for healthy eating by allowing them to share their cooking ideas and pointing out community resources. However, they reacted negatively to hearing their peer's suggestions for how they should specifically modify their existing habits. In summary, participants liked the idea of sharing information that was *personally reflective*, meaning that it is about the information sharer's experiences and ideas, and does not come in the form of directed commentary on the habits of others.

#2 - Support the Sharing of Low Risk Information: In addition, while participants valued community-shared information on healthier cultural recipes, healthy options at fast food restaurants and other local establishments they did not value peer advice on nutrition topics. The latter was seen as questionable in terms of its trustworthiness. For my work, the implication of these findings is that instead of supporting people in sharing lay nutrition knowledge (*e.g.,* about the effects of certain nutrients on one's body, which may be harder to assess in terms of its trustworthiness), a future application should support the sharing of more experiential knowledge and the identification of community resources – information for which the stakes are lower in terms of proving its validity. As such, this design implication reflects a nuanced take on the lay health advisor model (described in Chapter 2), in which health advocates seek to improve community wellness by helping residents gather health knowledge. Based upon my participants' responses, this knowledge should be restricted to information in which the risk of the information being inaccurate is low.

#3 - Make Community Success Visible: Participants indicated that talking about the challenges in the community was an unproductive approach to improving eating habits. In contrast, they felt that showing individuals' successes was important and

valuable. Thus, a future system should highlight the ways in which community members are succeeding at eating healthfully. This is in line with the celebratory health technology approach that I articulated in my previous work (Parker, Harper and Grinter 2011), in which design starts with trying to examine how to leverage, make more visible or highlight the ways in which people are doing well – and uses that success a springboard for encouraging healthier behaviors in the future.

#4 - Bring it Back to the Individual: As the first three design implications show, my participants felt that, while focusing on the community, it is important to focus on how *individuals* can and are making healthy decisions in the community. A future system should help users understand how to translate a general awareness that it is important to eat well into their everyday lives. Furthermore, my participants made it clear that it is important that a future system shows individuals how to eat healthfully given their cultural, local and temporal reality.

#5 - Support Action: Finally, my participants indicated that it is important to not simply talk about community health issues. Ultimately, it is important that a technology encourage action amongst community members, such as the modification of existing cultural recipes or taking steps to confront the challenges to eating healthfully in the community. While information sharing is important, the application's focus should be weighted more towards actual modification of behaviors than discussion.

5.1.5 Summary of Answers to Research Questions

The results of the focus groups I conducted with YMCA members and staff provide deeper insight into RQ1: *With what aspects of nutrition are individuals in low-income African American communities most interested in receiving support and what socio-cultural considerations should be made when providing this type of support?* In Chapter 3 I described how the results of my first formative study showed that participants were most interested in learning new healthy eating strategies. Through the focus groups at the YMCA, I was able to identify more specific desires. Participants in the YMCA study were most enthusiastic about receiving the following kinds of information about healthy eating from other community members: 1) healthier versions of cultural recipes, 2) resources for healthy eating that reflect the area in which they live as well as their busy

lifestyles and 3) information that helps motivate and provide actionable ways for people to engage in healthy behavior change.

In addition, my results foreshadow the answer to RQ2 by highlighting the characteristics of the shared information that participants said they would value. They felt that when sharing information about healthy eating, the content should be 1) easy to accept in terms of its trustworthiness (*e.g*, recipes as opposed to medical advice), 2) personalized such that it is grounded in individuals' experiential knowledge (as opposed to more generalized healthy eating recommendations) and 3) focused on how community members have successfully eaten well as opposed to focusing on the barriers to healthy eating that exist in the community.

5.2 HCI Expert Evaluation & Pilot Deployment

Once I derived the design implications described above, I engaged in an iterative design process to arrive at the final prototype of Community Mosaic (CM). Throughout the design process, the basic concept of CM has remained the same: CM allows users to send text (SMS) and picture (MMS) messages from their cell phones showing how they are trying to eat well in their local community. These messages are then visualized in the CM software.

I began by conducting brainstorming sessions with my development team (which consisted of myself and two HCI Master's students). During this period, I determined how to best translate the design implications from my formative work into a functional system. I developed a feature list for the system and sketched ideas for the interface design (see Figure 4). I then worked with my development team to create a medium fidelity prototype (Figure 4). This prototype worked as follows. Users were able to send SMS and MMS messages to the Community Mosaic phone number (which corresponded to an Android phone using a SIM card that we purchased for this project). Software (programmed by a member of my development team) ran on the Android phone and processed incoming messages. Once a message was received, the software sent users a response SMS thanking them for their message. The response SMS also presented them with a list of emotion tags and asked if they wanted to attach one to their message. These tags were a way for users to share the emotion that they felt when they created their

Figure 4. Early sketches of the Community Mosaic visualization (top) and screenshots of the medium fidelity prototype's Main Screen (center) and Detail Screen (bottom). In the Detail Screen, there is a circular "commit" button that users can press to indicate that they commit to trying the strategy shown in this message. At the bottom of both the Main and Detail Screens, the number of times people have pressed commit buttons "today" is displayed next to the "commits today" label.

message, and thus how they felt when engaging in the healthy eating idea that they were sharing. The possible emotions were: (1) encouraged, (2) relaxed, (3) neutral, (4) stressed and (5) discouraged. If users wanted to attach an emotion tag to their message, they could respond with a text message containing the corresponding number (1-5). In my evaluation of EatWell (Grimes et al. 2008), I found that the emotion expressed in participants' audio stories was part of what made the content engaging. Thus, in this version of the CM prototype, I examined the value of using tags as a way of allowing users share emotion.

In this version of the prototype, the messages that users shared were visualized on software that I displayed on a computer monitor (see Figure 4). Users were able to interact with the software by using a mouse and clicking on the relevant buttons. Each message that they sent appeared as a window in a building and users could click on any window to view its details. Once they clicked on a message, the larger version of that message's photo (if any) was displayed along with any text that the user had sent, the date and time of the message, the emotion tag and a button allowing them to indicate that they commit to trying the healthy eating strategy shown in the message.

I conducted an initial evaluation of this prototype by inviting 5 HCI experts (Ph.D. students in HCI) to send messages to the system for one week (see Appendix D.1 for more details of my initial meetings with participants). At the end of this period, participants came to a session in which they were shown the CM interface and asked to provide their feedback both on the process of sending messages and the CM visualization software (see Appendix D.2 for more information). Participants provided a variety of useful suggestions for improving the design. By analyzing my detailed notes from these sessions, I distilled the most prevalent and useful suggestions for improving CM. Below is a summary of this feedback and how I changed the design based upon it:

- **Reminders.** Participants said that it was difficult to remember to send messages and that some type of reminder would be useful. In the final iteration of CM I used two types of reminders: a weekly SMS update message and a sticker that all users were given to place on their phone. This sticker reminds them to send messages and contains the system phone number.

- **Emotion Tags**. Attaching emotion tags was awkward for participants because the options given either did not match how they were feeling or because they did not see the point in sharing this information. In addition, due to system delays, users would often receive the SMS message asking for their emotion tag well past the time that they had sent their message. At that point they could not remember what emotion they were feeling when sending the message. I removed this feature from the final version of CM as I felt it would be too cumbersome for the system to ask users to attach emotion tags to their messages. It was important that the message sending process feel as lightweight as possible to encourage participation.
- **Grouping Messages.** In the medium fidelity prototype, there was no way for users to tell which photos were sent by the same user because each message shows up anonymously as an individual building window. One participant suggested modifying the design such that users can easily identify messages sent by the same person. This would allow message senders to tell a story, for example sending a photo of a new meal they were preparing and then a follow-up message to say how their family reacted to the new dish. I addressed this in the final prototype by adding functionality that lets users easily browse messages that have been sent by the same person.
- **System Wording & Labels.** In the medium fidelity prototype, users could indicate that they were going to commit to trying new ideas by pressing a "commit" button in the detail screen for any message that they view (see Figure 4). The system keeps track of the number of times users have pressed the commit button each day and displays this tally at the bottom of the main CM window with the label "commits today". The system also displays the number of new messages sent that day in the same area with the label "new messages today". Some participants felt that these labels were too formal and dry. Thus, in the final version of the prototype we changed the wording for these labels, making them more community-focused and compelling. Participants also felt that the word "commit" was awkward and that it did not convey the right meaning (*e.g.,* one participant said it made her think of marriage, not healthy eating). To address this

issue, in the final system we modified the wording, such that users could indicate whether they were "inspired" to try the ideas shared in CM.

- **Aesthetics.** Participants also suggested that we make the visualization stand out more as they felt the colors in the GUI were washed out. This was important feedback for me to consider, as my goal was to design a GUI that was attention-grabbing enough to entice people to use it. In addition, one participant mentioned that we should more clearly indicate which parts of the GUI were clickable, since the buttons on the screen did not afford clicking. Thus, in the final version of CM I worked with my GUI developer to make the colors more vivid and modify the buttons such that it is clear users can press them.

I revised the CM design as described above and installed the fully functional version in a public area of a Georgia Tech office building. I posted signs encouraging people in the building to use CM by sending messages and interacting with the public display. Over a month-long period, this pilot deployment allowed the development team and I to fix system bugs and make the software more robust (*e.g.*, making the MMS/SMS processing software fully functional and fixing bugs in the CM display software).

5.3 Community Mosaic Overview

I will now describe the final design of Community Mosaic, which is based upon the results and design guidelines that came out of my formative focus groups, HCI expert evaluation and pilot deployment. I first provide an overview of how the system works and then discuss how the design was directly informed by my formative research.

5.3.1 User Interface Experience

Community Mosaic reflects one of the main goals of the LHA model, which, as I discussed previously, is one approach to designing collectivist health interventions. Specifically, CM supports lay people in sharing ideas for eating well with community members – information that is, ideally, locally, culturally and temporally relevant. CM has two interface points: the user's personal cell phone and the visualization software (CM Visualization) that runs on a large public display (a touch-screen monitor).

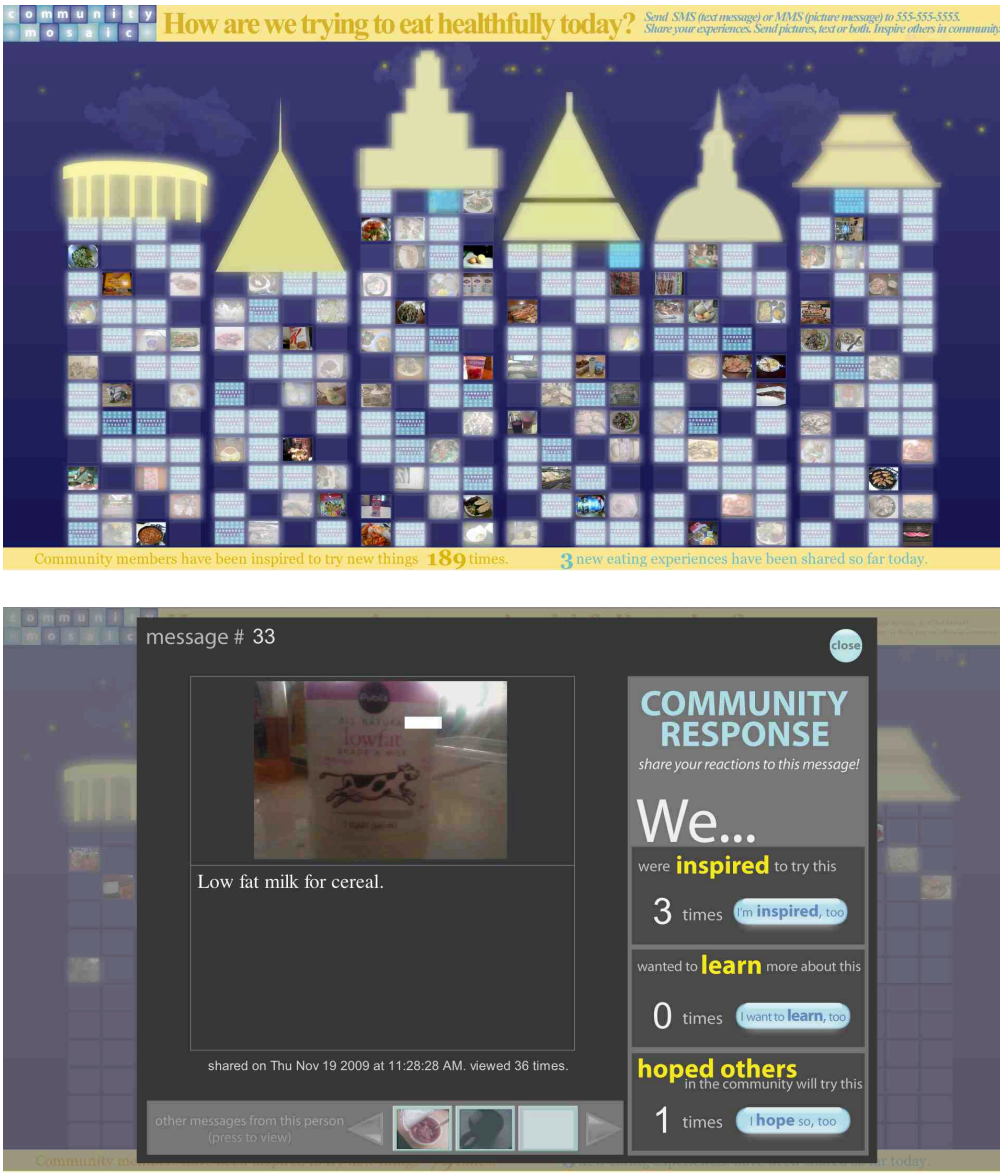

Figure 5. The final version of Community Mosaic, including the Main Screen (top) and Detail Screen (bottom).

Experience Sharing: In the CM Visualization (shown in Figure 5), users are encouraged to share "how they are eating healthfully today" with the community by using their existing cell phones to send picture (MMS) or text (SMS) messages to the CM phone number. The visualization also invites them to *"Share your experiences. Send pictures, text or both. Inspire others in the community."* The messages that users send can be of foods, people, places – anything that they feel is aiding them in trying to eat well. Messages are displayed in the CM Visualization software that runs on a 42" touch-screen monitor. Once a user sends a message, they receive a response text message letting them know that their message has been received.

CM Visualization Main Screen: The CM Visualization software works as follows. The Main Screen shows a set of buildings that are evocative of the Atlanta, GA skyline (Figure 5). Each building window represents one message that someone has shared. As messages are sent to CM, the building windows illuminate, either showing a small version of the picture shared, or in the case that the user has shared a text message only, the CM logo appears in the window. (The blank blue windows indicate that no message has been posted to that position yet.) Thus, as the community shares an increasing number of messages, the windows will illuminate, until all the building windows are filled. The metaphor here is that the community works together to in a sense, build the city, by sharing their experiences. Windows are populated based upon a pre-defined pattern that ensures messages are spread relatively evenly across the buildings. Windows with messages that have been sent "today" are overlaid with a pale blue, flickering light, helping users to locate new content. The total number of new messages shared each day is also displayed at the bottom of the Main Screen.

Messages are not displayed until the system moderator has approved the message. In the deployment study I moderated messages to ensure that no offensive content was shared and that messages met the health standards of the YMCA (*e.g.,* that people were not promoting supplements or particular diet programs).

CM Visualization Detail Screen: Users can go up to the display and press any of the illuminated building windows to reveal its contents. Once a building window is opened, it shows the details of the message: the picture (if any), the text (if any), the date

and time it was sent and how many times the message has been viewed (Figure 5). All messages are shown anonymously, meaning that neither the sender's name nor telephone number is displayed. The detail screen also allows viewers to see all of the other messages that this anonymous user has sent. At the bottom of the screen, users can scroll through thumbnails representing other messages that the same user has sent. They can then press any of the thumbnails to view the Detail Screen for the message it represents.

On the right side of the Detail Screen is the Community Response Panel. This panel allows users to quickly and easily share their reactions to the healthy eating strategy in the message by pressing any of three buttons that say: 1) I'm inspired to try this, 2) I want to learn more about this or 3) I hope others in the community will try this. A tally appears next to each button showing the number of times it has been pressed. The bottom of the CM Visualization Main Screen displays the total number of times community members have been inspired to try ideas shared in CM.

Message Popularity: In the CM Visualization Main Screen, messages that are more "popular" are shown with a high transparency, whereas messages that have had less interaction are shown more opaquely. The popularity of each message is calculated by summing the number of times the message has been viewed and how frequently its Community Response Panel buttons have been pressed. The goal is to show how much the community has viewed and responded to different messages.

Update Messages: Once a week, each user receives an update text message letting them know how many messages were shared in Community Mosaic during the past week. (Users can opt-out of these updates.) The update message was also personalized to let each user know how many times people were inspired to try messages that they had personally shared. CM calculates this information by tallying the number of times people have pressed the inspired button in the CM Visualization for each user's messages. If the inspired button was never pressed for a user's messages, that person's update message says, *"X Community Mosaic messages were shared this week. Your opinions matter. Please keep sharing!"* If people were inspired by the user's messages, that person receives an update message saying, *"X Community Mosaic messages were shared this week. People were inspired to try things you've shared Y times. Please keep sharing!"*

CM reflects the design guidelines that I developed in my initial fieldwork (Chapter 3) in the following ways. First, like EatWell, Community Mosaic *"Acknowledges Community Expertise"* by providing a platform on which members of the community can share their healthy eating ideas. Indeed, community members create all of the information shared in the system. Second, Community Mosaic *"Supports Learning from Community Experience"* by asking users to document their day-to-day experiences with trying to eat well, and making that information publically accessible through the CM Visualization at the YMCA. Finally, CM *"Accounts for Cultural Uniqueness Without Alienating"* by allowing users to share any type of healthy eating idea and not specifically asking them to share, for example, cultural recipes (which would assume that this is something that every person in the community would value sharing). In addition, by asking users to share how they are succeeding at eating well, CM does not overly emphasize the health disparities that exist, which could paint a negative image of the community. Participants at the YMCA also discussed not wanting to focus on the community issues, and later in this chapter I further detail how CM facilitates the sharing of successes, not challenges.

Distinction from EatWell

CM differs from EatWell because it allows people to share photographic and textual information (instead of audio information) and there are mechanisms for users to receive feedback on the information that they share. In addition, I designed CM to be an interactive public display system for a community-oriented center such as the YMCA. By creating a *public* display, my goal was to make the community-held knowledge about healthy eating more visible than in EatWell. Recall that in EatWell, people could only get a sense of what information had been shared by calling the system or by the text message updates they received. In Community Mosaic the community knowledge is more persistently visible. With this design, I was able to answer RQ3, as I examined how seeing and interacting with others' health commentary affects how people conceive of their community. In addition, CM helped me to answer RQ4, as I examined to what extent contributing information to this publicly viewable display helps people to feel that they can and are improving the health of their community.

5.3.2 Technical Implementation

When users send a message to CM, it is processed by SMS/MMS Gateway software written in Java. The gateway runs on a Google Android G1 phone that is equipped with a SIM card. The gateway parses the message and extracts the sender, date and time of message, the photo (if any) and the text message (if any). Once this information has been extracted, it is sent wirelessly (using the SIM card's data network) to a computer server located at Georgia Tech. On this server, the Community Mosaic Processing software (which I wrote using PHP and SQL) stores the sender, date, time, text message (if any) and picture (file location, if any) information in a MySQL database. This processing software also saves the photo image file on the server. The CM Visualization software was written in Adobe Flex and PHP and is shown in a full-screen mode web browser on a 42" Samsung TSN-2 touch-screen monitor.

I developed CM together with two Master's students. One student implemented the CM Visualization software and another implemented the SMS/MMS gateway software. I led the development effort by supervising and giving technical and design direction to both students and helping them troubleshoot errors in the code. In addition, I wrote the code for the Community Mosaic Processing Software.

5.4 From Design Implications to Design

In this section, I detail how I specifically incorporated the design guidelines from my formative focus groups into the design of CM.

5.4.1 Increasing Options Through Low-Risk and Personal Information Sharing

One of the main goals of CM is allowing people to make nutritious foods and community resources for eating healthy more visible. In this way, I incorporated the design guideline, *Support the Sharing of Low Risk Information*, by enabling users to share their experiences with trying to eat well locally rather than nutritional information that might require more expertise (*e.g.,* detailed information about how specific nutrients affect one's body). Furthermore, by asking people to share how they are trying to eat well on a daily basis, CM encourages them to not simply share impersonal recommendations or advice, but rather their lived experience with trying to engage in wellness. This aspect

of CM addresses the design guideline, *Bring it Back to the Individual* by supporting the sharing of personalized eating strategies. Indeed, the goal of CM is that people will share personal experiences that reflect the practical reality of trying to eat well given one's physical environment (local resources), cultural environment (the foods that reflect one's heritage and the more general culture of eating that one is surrounded by) and one's temporal reality (trying to eat well in a world that is often hectic).

5.4.2 Reflection, not Critiques or Advice: Message Sharing & Community Response Panel

By prompting users to share "how *they* are trying to eat healthfully today", and document their *personal* eating experiences, CM attempts to scaffold users in sharing reflective information about themselves and not directed commentary about how others should be eating. This addresses the design implication, *Support Personally Reflective Information Sharing*. I further address this design implication because there is no mechanism for users to directly critique the messages that are sent to CM. The only commentary that participants can share is that which is in the messages they send documenting their personal experiences. Furthermore, the buttons in the Community Response Panel let viewers share how the message affected them personally but there are no response buttons that allow them to critique messages.

5.4.3 Success – Not Challenge – Sharing

In my early design brainstorms (done prior to conducting my formative research), I considered designing a system that allows community members to share their struggles with healthy eating. I thought that this might be a useful way of bringing about solutions to those issues and helping the community rally against the problems. This thinking was motivated by research on the LHA model, which has shown that by interacting with community members, LHAs develop a better sense of the health issues in their community and are thus better poised to know what problems need to be addressed (Plescia, Groblewski and Chavis 2008). However, as I discussed earlier, my formative work showed that participants were very much against a technology that focused on discussing the existing problems in the community.

Thus, I addressed the design principle, *Make Success (Not Challenges) Visible* in the following ways. First, in CM users are encouraged (through the prompts in the Visualization software) to share how they are trying to eat healthfully and to thereby inspire others in their community. Second, in the weekly SMS updates they receive encouragement to share their success through messages such as, "Your opinions matter, please keep sharing how you're trying to eat healthfully". This is all in contrast to, for example, encouraging people to share their struggles in trying to eat healthfully. Sharing one's struggles might indeed be a useful process, as is seen in online health communities in which people share their challenges and receive support. However, my participants were more interested in a system that focused on the positives. Third, CM makes publically visible the variety of ways in which community members are succeeding at trying to eat well by showcasing them on a large public display. My goal is that in doing so, others in the community may be inspired to try the ideas shared in the system or to eat better in general.

5.4.4 Supporting Action Through Message Contribution, a Public Display & Response Buttons

There are three main ways in which CM incorporates the *Support Action* design guideline by directly encouraging users to engage in healthy behaviors. First, to contribute to Community Mosaic, the system requires you engage in a healthy behavior yourself so that you can document it and share it with the community. Thus, by the very nature of being a CM contributor, users are encouraged to not simply talk about healthy eating but to actually do something to be healthy. Second, in the "Other Messages From User" section of the CM Visualization Detail Screen, viewers can see a contributor's history of action. This part of the interface shows concrete examples of individuals engaging in healthy behaviors over time – which will hopefully help viewers feel that they have the ability to do the same thing. Third, the buttons in the Community Response panel focus on letting viewers share, in a lightweight way, their thoughts on moving the community towards action (the "I hope others in the community will try this" button) and if they personally were inspired to act upon the information seen (the "I am inspired to try this" button).

5.5 Summary

In conclusion, I went through an iterative design process to develop Community Mosaic in a way that meets the needs and desires expressed by members and staff of the YMCA in my formative focus groups. Through an evaluation with HCI experts and a pilot deployment of Community Mosaic at Georgia Tech, I was able to further refine the design and increase its robustness in preparation for the deployment at the YMCA. In the next chapter I describe this deployment and the results that came out of my analysis of the study data.

CHAPTER 6

COMMUNITY MOSAIC EVALUATION

In this chapter, I describe my evaluation of Community Mosaic (CM). I begin by describing my methodology and analysis process. I then provide a description of my participants before moving into an in-depth discussion of the results of my study. I conclude this chapter by summarizing how my findings answer RQs 2-4.

6.1 Method

I conducted a field study to examine the use, effectiveness and impact of CM. The study lasted approximately 12 weeks, from start to finish (for a timeline describing the progression of the study, see Table 3). During this 12-week period, participants were able to send messages to CM; the CM Display was installed in a public location of a YMCA branch in Atlanta, GA for 6 weeks during this time period. While it was my desire to place the display in the area of the YMCA with the highest amount of traffic (the main lobby), I was asked by the staff to place it in an alternate location: a much lower-traffic portion of the lobby near the locker rooms, entrance to the basketball courts and vending machines. They felt that this alternate location was more ideal since there was already a lot activity, devices and flyers in the main part of the lobby. Thus, placing CM in that environment would be too much for the space to handle. Furthermore, this alternate location allowed me to securely lock down the monitor.

The CM Display consisted of a large touch-screen monitor that was mounted on a stand (see Figure 6). My intention was that the Display would remain powered on and accessible for the duration of the study. However, there were gaps in its functioning due to holidays, multiple thefts of the machine's USB wireless internet adapter (the monitor did not have a built in adapter and I was not permitted to connect to the YMCA's wired network), people turning the machine off or otherwise disturbing the system, system malfunctioning due to network downtime or slowness and system malfunctioning due to software bugs. I posted a large sign next to the CM Display describing how to use it and inviting anyone (even if not formally enrolled in the study) to interact with the CM

Table 3. CM field study timeline.

Dates	Activities Performed
May 3-May 22	Introductory Sessions. Participants were immediately able to send messages during this time, to help seed the CM display database. (n=43)
May 21-July 3 & July 19	The CM Display was installed at the YMCA for 6 weeks and it was used for 25 of those 44 days (due to the gaps in usage described above).
June 10-June 18	1st Round of phone interviews (n=23)
July 1-July 18	2nd Round of phone interviews (n=26)
July 20-July 24	Closing CM Sessions (n=38)

Display Visualization and send messages to the system. In addition, I posted additional signs letting people know that the views expressed in CM did not necessarily reflect those of the YMCA (as requested by YMCA administrators). I also placed flyers next to the display that overviewed the purpose of CM and how it works.

Before beginning the field trial, I secured approval for the study from my contact at the YMCA (the wellness director), her supervisor (a director of that branch of the YMCA) and the Metro Atlanta YMCA research review panel. For the protection of the YMCA membership, the panel required me to moderate the messages shared in CM, making sure that they met the following guidelines:

1. Avoid postings naming specific dietary eating plans, for example, "Jenny Craig," "Weight Watchers," and "Quick Weight Loss".
2. Avoid postings about food, vitamin and mineral supplements, meal replacements, shakes, etc.
3. Avoid postings that foster caloric intake less than 1200 for women or 1500 for men with nominal weight loss needs. If members are obese, then the rule of thumb outlined in the ACSM paper should apply, that is, gradual reduction of no more than 500-1000 caloric deficit daily.
4. Avoid postings that promote cola products. The YMCA refrains from mentioning Pepsi products.

In the sections that follow, I provide more detail regarding my methodology, including an overview of what participants did in this study, a more detailed description of my research instruments and a description of the participants.

Figure 6. Community Mosaic installed at the YMCA during the field deployment.

6.1.1 Participation Overview

I recruited participants by placing flyers in the YMCA, making announcements in exercise classes and asking participants to encourage other YMCA members to sign up. Three groups of people used CM and the grouping simply specified their level of participation in the study. The participation consisted of the following:

- **Group A**
    1. Introductory Session: At this first session (conducted at the YMCA), I described the study to participants and explained how to send messages to CM and how to use the CM Display. Participants also completed a pre-intervention survey. Finally, they were given a CM User Guide to take home (see Appendix E.6). This session lasted one hour.
    2. Technology Trial: Participants were asked to send 1-2 messages per month to CM (or more, if they liked), for the duration of the study (3 months).
    3. Closing Session: At the end of the study, participants came to a final session at the YMCA where they filled out a post-intervention survey and a CM Interface evaluation survey. Group A participants spent approximately 45 minutes in this session.

- **Group B**
    4. Follow-Up Interviews: In addition to items 1-3 above, Group B was also asked to complete two follow-up interviews (after approximately 3 and 6 weeks).
    5. Closing Session: In addition to the activities described in item #3 above, Group B participants completed a survey in which they evaluated a subset of the messages sent to CM. These participants also participated in a short focus group during this closing session. Group B participants spent approximately 90 minutes in this session.
- **Group C**
    1. Finally, anyone who went into the YMCA was encouraged to use CM through signs that I posted around the CM Display. The signs also encouraged these individuals to send messages to CM (even if they were not formally enrolled in the study). These participants were included through the Institutional Review Board "waiver of written consent" process and constituted Group C.

For their participation in the study, all Group A participants received a $30 gift card and those in Group B received a $60 gift card at the end of the study. Others using the system (*i.e.*, those in Group C) did not receive any compensation.

6.1.2 Data Collection

As mentioned above, I used surveys, interviews and focus groups to gather data from participants. In addition, I conducted non-participant observations of people using the CM display and logged system usage. Below I discuss my data collection process in more detail.

Pre-Intervention Surveys

In the Introductory Session, participants in Groups A and B completed a pre-intervention survey (see Appendix E.2). The survey asked demographic questions (*e.g.,* household size, income level and educational level), questions regarding their nutrition-related habits and attitudes, and questions about their technology usage history. In

addition, the survey included two sets of questions that assessed their position within the Horizontal-Vertical/Individualism-Collectivism and Transtheoretical Model (TTM) frameworks. Below I review the types of survey questions in more detail:

- *Demographics*: Participants were asked questions about topics such as their marital status, income level, occupation and number of children.
- *Nutrition-related measures*: Participants were asked questions related to nutrition, including how confident they were in their ability to give nutrition advice to others (RQ4), their confidence in YMCA patrons' ability to give them useful healthy eating information (RQ3) and how much they know about eating healthfully (RQ3). Participants recorded their answers to these questions using a 5-point Likert scale.
- *Technology*: To understand participants' comfort level with technology related to that leveraged by CM, participants were asked how frequently they use MMS and SMS, how often they take and view photos on their cell phones and their familiarity with touch-screen displays.
- *Collectivism*: Though the African American culture is seen as collectivist on the whole, there is certainly individual variation within this group. Thus, I assessed participants' position within the Horizontal-Vertical/Individualism-Collectivism Framework using a survey that was developed and validated by Sivadas *et al.* (Sivadas, Bruvold and Nelson 2008). This measure allowed me to calibrate participants' use of and reaction to CM based upon how important the construct of collectivism is to them (*i.e.,* how group versus individually-focused they are). For more information regarding this framework, please refer to Chapter 2.
- *Transtheoretical Model* (TTM): Finally, I assessed participants' position within the TTM (discussed in detail in Chapter 2). The TTM is a framework that helps identify an individual's position along a continuum of behavior change. The model specifies five stages of change that individuals go through as they try to develop a healthy lifestyle. These stages are: *precontemplation* (not thinking about making a change), *contemplation* (thinking about making a change), *preparation* (preparing to make a change), *action* (adopting a new behavior) and *maintenance* (changes have been made for some time). I used a set of survey

questions developed by Kristal *et al.* to assess participants' stage of change with respect to trying to eat a low-fat diet (Kristal et al. 1999). This information helped me better interpret participants' use of and reaction to CM.

Interviews

I conducted 15-30 minute semi-structured interviews with Group B participants twice: approximately 3 and 6 weeks after the CM display had been installed at the YMCA (see Appendices E.3 and E.4 for my interview guides, which I used as a springboard for discussion). During the interviews I spoke to participants about a number of topics, including their experience sending messages and using the CM display, their motivation for sending messages to CM and to what extent their use of CM affected their personal eating habits, nutrition-related attitudes and their perception of their ability to help the community.

Closing Sessions: Surveys & Focus Groups

In the Closing Sessions, Group A and B participants completed a post-intervention survey that provided a compliment to the interview data (see Appendix E.2). In particular, I examined how their responses to the nutrition-related questions (described above) changed from the pre-intervention surveys. This survey also asked questions regarding participants' use of and reaction to the Community Mosaic system.

In addition, I setup two workstations in the room where the Closing Sessions were held. These workstations consisted of a computer, a mouse and a large flat-screen monitor that displayed the CM interface. All participants were presented with a set of instructions for navigating through the interface (*e.g.*, "Look at the Main Screen and click a window that interests you") and a set of survey questions through which they could provide specific feedback on the CM interface design (*e.g.*, whether or not the "Community Response Panel" was useful).

Group B participants also completed a survey through which they evaluated a subset of the CM messages. In this survey they specified which messages were the most aesthetically appealing to them, if any had ideas that actually seemed unhealthy and if any had ideas that they hoped to try in the future. Participants were also asked to indicate

how they would like to see messages organized in future versions of CM. I selected 36 messages from the 278 that were shared during the study. To obtain a diverse set of messages, I assessed each message's popularity based upon the number of times it was viewed and the number of times the Community Response Panel buttons were pressed for the message. I then chose the four most popular messages, the four least popular and four messages that were in the middle in terms of their popularity (a total of 12 messages) from three different periods during the study (the first 2.5 weeks, the following two weeks and the final two weeks that CM was running at the YMCA). I printed these 36 messages and showed them to participants at the Closing Session to aid them in completing their message evaluation survey.

Finally, individuals in Group B participated in a short semi-structured focus group at the end of the Closing Session (see Appendix E.5). These focus groups lasted an about 20 minutes on average. In these focus groups, participants discussed how useful they felt CM was for the community, how it could be improved and the extent to which competition should be facilitated in future versions of the system. Having participants discuss these topics in a group forum was useful as CM is focused on the health of the community and not just the individual. As such, I felt that a group setting might allow me to uncover issues and topics that I may not be able to touch upon in the individual interviews.

Non-participant Observations

I also conducted in-person, non-participant observations of people using CM to gain a contextual understanding of how people were using CM. To do this, I sat in the area in which CM was installed (within earshot but as distant from display as was possible) and attempted to inconspicuously take notes about how many people were using CM, their reactions to it and anything that was said while using it. After several hours of observation, it became clear that while trying to remain inconspicuous, my presence was deterring individuals from using CM while I was there. By looking at the system logs, I noticed a sharp uptake in use after I left the YMCA and while there, I noticed that people did not seem to be using it as often as the logs showed. My conclusion was that people may have felt uncomfortable using CM while I was sitting in the area since the space

where CM was deployed was more of a pass-through area, and not some place where it was normal to see people sitting around. Thus, I decided to stop my observations, as I was able to obtain an abundance of data regarding people's use of the system through the various methods described above.

System Logs

I logged system usage in a MySQL database. First, I logged message submission information (*e.g.,* the date and time it was shared and who shared it). With respect to the CM Display application, I logged each time a message was opened and closed (including the message ID number, date and time) each time a Community Response Panel button was pressed (including the ID of the message being viewed at the time, which button was pressed, date and time).

6.1.3 Analysis

In this section, I discuss the process I used to analyze data from the interviews, focus groups, surveys, and system logs. I then describe the content analysis approach I employed to examine the messages shared in CM.

First, I conducted a thematic, inductive analysis of the interview and focus group transcripts (Thomas 2006). I read the interview and focus group transcripts line by line to derive a set of codes that described the emergent phenomena in the data. As I analyzed each transcript, I entered emergent codes and the corresponding text to which the code applied into a Microsoft Excel spreadsheet. I used this spreadsheet to automatically count how frequently each code occurred across participants. I then iteratively clustered these codes to arrive at higher-level categories, and eventually, the overall themes that I present in the Results section of this chapter.

Second, I analyzed the survey data with the help of a research assistant by first entering all survey data into Excel. Once the data was digitized, we computed the mean and standard deviation for all Likert scale questions. I further broke down participants' responses and looked for variations in responses based on participants' place within the Horizontal-Vertical/Individualism-Collectivism (HV/IC) Framework. I also conducted a statistical analysis of the survey data using SPSS Statistical software (Field 2009). To

examine how CM impacted participants' nutrition-related attitudes, I measured their responses to a set of questions pre and post-intervention and computed the differences in means using a Repeated Measures ANOVA. When computing the ANOVA, I used the pre- and post-intervention survey answers as the within-subjects variables and the HV/IC Framework categorization as the between-subjects factor. This analysis allowed me to examine whether or not participants' responses varied after using CM and if they varied between HV/IC groups. I then used a Multivariate ANOVA to examine specific differences between the HV/IC groups pre and post intervention. In particular, I compared those individuals who were classified as horizontal collectivist (HC) and horizontal individualist (HI) as the vast majority of participants fell into these categories. Finally, I used a One-way ANOVA to examine differences in HV/IC groups along measures that were only collected post-intervention.

Third, I analyzed the system usage logs by running SQL queries and computing descriptive statistics regarding the frequency and nature of participants' interactions with CM (*e.g.,* the average number of messages sent by each participant, the frequency with which CM buttons were pressed and which messages were the most and least popular).

Content Analysis of CM Messages

Finally, together with a research assistant, I conducted a content analysis of the messages that participants shared. Understanding the nature of the content shared helped contextualize the results of my interview and survey data analysis, particularly with regard to how CM messages affected viewers' understanding of the nutrition-related resources that exist within the community and their ability to eat healthy in the community (RQ3), and the extent to which they felt that they were helping improve the health of the community by using CM (RQ4).

I conducted a deductive analysis of the CM messages (both the photos and text shared). My code set was partially developed based on the results of my analysis of the EatWell memory clips. In EatWell, I found that few messages described cultural foods but that many described local establishments. Thus, I examined to what extent these trends were replicated in the CM messages. In addition, I examined to what extent messages contained information that was clearly personalized (*i.e.,* strategies that they

had actually tried themselves) versus more impersonal information through which users were simply making recommendations for what others should do or stating their opinions regarding healthy eating. It was important for me to examine the extent to which messages were personalized because one of the guidelines that came out of the formative focus groups (Chapter 5) was that CM should support the sharing of self-reflective information that is informed by participants' experience. Finally, I also examined the extent to which participants described the taste of foods, as the value of taste was emergent theme in my interviews.

After developing the code set, I randomly selected 56 messages (20% of the total corpus) for my research assistant and I to code independently. Once we had each coded the same 56 messages, I compared our ratings and determined the inter-rater reliability by computing how frequently our ratings were the same. During our first pass, we had an overall agreement of 94%. We then met to examine the divergences in our ratings until agreement reached 100%. We then randomly split the remaining messages and coded them separately. Once this coding was complete, we each reviewed the others' codes and identified areas of disagreement. We then met to discuss these discrepancies until we arrived at 100% agreement.

6.1.4 My Role: System Designer, Data Collector, Data Analyst & African American

It is important to reflect upon how my role in this project may have influenced my ability to effectively collect and analyze data in this study. I was both the system designer and data collector, and in such cases participants can feel hesitant sharing negative feedback because they may want to avoid hurting the feelings of the designer. In my evaluation of CM, I found that this hesitation might have also arisen because my participants and I had a shared identity as African Americans. Many participants were excited to be a part of the study because they were proud to see an African American woman pursuing a Ph.D. As such, I recognized that their excitement for me, together with the fact that I had designed CM might make them hesitant to share their true feelings about CM, particularly if they did not like certain features or if they felt that it was ineffective. To address this challenge, during my interactions with participants, I tried to downplay my role as the system designer. In addition, in the interviews, focus groups and

surveys, I repeatedly and specifically encouraged participants to share not only what they liked about CM but also what should be changed and any weaknesses that they felt the system had.

As many participants were eager to support me in my pursuit of my degree, I was also careful to critically examine their motivation for using CM, including to what extent they benefited from using the system beyond supporting me. Finally, as the system designer and data collector, there were some benefits and challenges that arose with me acting as the primary data analyst. On the one hand, I had an intimate understanding of my participants, having spent time speaking with them over three months. This relationship as well as being able to recall the tone of their voice, facial expressions and the like during interviews and focus groups helped enrich my data analysis process. At the same time, because I was so intimately involved with the study I went out of my way to ensure that I was critically examining the data during my analysis process, particularly during my inductive analysis of the interview and focus group transcripts. It was important for me to ensure that I was not only looking for trends that appeared to be coming up as I was collecting data, but to be open to emergent phenomena that I had not yet considered.

6.2 Overview of Participants

I recruited participants by contacting individuals who had participated in the formative focus group study (Chapter 5), making announcements in exercise classes at the YMCA, posting flyers at the YMCA and asking participants to encourage their friends and family members to sign up. I had an overwhelmingly positive response when recruiting for this study and actually had to turn some volunteers away because I did not have the resources to include them in the study.

In total, 43 people participated in this study: 14 were enrolled as Group A participants and 29 as Group B participants. Twelve participants had participated in the formative focus groups described in Chapter 5. The attrition rate was 12% as 38 of the original 43 participants completed the study by coming to the Closing Session (11 from Group A and 27 from Group B). All 29 Group B participants completed follow-up interviews during the study (20 completed two interviews, nine completed one).

Thirty-four females and seven males participated in the CM field study. While I tried to achieve a balance of female and male participants, I had a much greater enrollment response from females. Most participants were aged 18-47 (n=28) and the remainder were aged 48-57 (n=9) and 58-67 (n=3). Twelve participants were married and 24 had children. Thirty-one were employed, eight were not and two were retired. Forty participants identified as Black, two as White and one as Black/White/Indian. While the membership of the YMCA branch that I worked with is primarily African-American, there is some cultural diversity and as such I chose not to turn away the two non-Black participants who signed up for the study.

Thirty-nine participants reported their income levels. Roughly half had a yearly household income between $13k and $45k/year (n=19) and the remainder had incomes of $45,501k to over $100k/year (n=20). According to Thomson & Hickey, that would approximately classify three participants as "lower class" (though I will use the term "poor" used by Beeghley), 11 participants as working class, 9 as lower middle class, 9 as between lower and upper middle class and 2 as upper middle class (Beeghley 2004; Thompson and Hickey 2005). Two participants receive food stamps. Participants' education level was unexpectedly high: 30 people reported that their highest educational degree was a Bachelor's or Master's, five reported that an Associate's was their highest degree and six said that a High School diploma or GED was the highest degree that they had received. Thus, many participants were financially comfortable and most were well educated. However, 59% of participants did fall into the categories of poor, working class and lower middle class. Thus, while I had a mixed sample socioeconomically, this sample reflects the somewhat socioeconomically diverse membership of the YMCA branch that I worked with. While the branch is located in and serves a decidedly low-income neighborhood, many patrons do come from more affluent and educated backgrounds. Still, I was able to gain useful data on the topic of developing technology to address health in low-income communities because 1) I did have many lower income and working class participants and 2) the more affluent and educated participants were familiar with the low-income community that surrounds the YMCA (either because they lived in or near it or because they frequented the YMCA branch).

I classified participants in terms of their position in the Horizontal-Vertical Individualism-Collectivism (HV/IC) Framework. In the collectivism portion of the pre-intervention survey, there were 14 questions, each of which corresponded to a sentiment that is characteristic of an horizontal collectivist (HC), horizontal individualist (HI), vertical collectivist (VC) or vertical individualist (VI) orientation (HC=4 questions, HI= 3 questions, VC=4 questions, VI=3 questions). Following the procedure used by Sivadas *et al*., for each participant, I averaged their ratings for each subset of questions to arrive at an mean score for their responses to the HC, HI, VC and VI questions (Sivadas, Bruvold and Nelson 2008),. The highest average score determined participants' classification as HC, HI, VC or VI. I found that, surprisingly, of the 39 participants who correctly completed this portion of the survey, most were HI (n=25) – not HC as I had expected. This finding counters much literature that suggests that African Americans are characteristically collectivistic. Instead, I found that only nine participants were HC. (I revisit this discrepancy in Chapter 7.) One participant was VI and none were VC. Four participants could not be classified definitively, with one person scoring equally high on HC and VC and three scoring equally high on HC and HI.

Finally, to better understand to what extent participants were trying to engage in healthy eating practices (as measured by how actively they were trying to eat a low fat diet), I determined their stage of change within the Transtheoretical Model (TTM). I found that of the 39 people who correctly completed the TTM portion of the pre-intervention survey, most were in the Preparation stage (n=22), 10 were in the Maintenance stage, 5 were in the Action stage, 1 was in Contemplation and 1 was Pre-Contemplation. Thus, participants were at a range of stages, but almost all were at least preparing to make changes to their healthy eating habits. More information regarding my participants can be found in Table 4.

6.3 Results

I begin this section with an overall review of system usage. I then move into a discussion of how together, my analysis of the interviews, focus groups, surveys, system

Table 4. Participant overview, including each participant's ID number, gender, age group, marital status (a checkmark indicates married), number of children, annual household income, TTM stage of change (P-C=precontemplation, C=contemplation, P=preparation, A=action, M=maintenance) and classification within the horizontal-vertical individualism-collectivism (HV/IC) framework (HC=horizontal collectivist, HI=horizontal individualist, VC=vertical collectivist, VI=vertical individualist).

ID	Gender	Age Group	Married?	# Kids	Yearly Household Income ($)	TTM Stage	HV/IC Framework Classification
1	M	18-27		0	< 13,000	M	VI
2	F	38-47	✓	4	22,501-27,000	M	HC
3	F	38-47		2	45,501-60,000	P	HC/HI
4	F	28-37		3	45,501-60,000	P	HI
5	F	48-57		2	18,001-22,500	C	HI
6	F	58-67		2	> 100,000	A	HC
7	F	38-47		2	22,501-27,000	P	HI
8	F	18-27		0	-	A	HI
9	F	28-37		0	45,501-60,000	M	HI
10	F	28-37		2	22,501-27,000	P	HI
11	F	28-37	✓	1	60,000-100,000	P	HI
12	M	18-27	✓	1	60,000-100,000	P	HC
13	F	28-37		2	45,501-60,000	P	HI
14	F	38-47	✓	4	60,000-100,000	A	HC
15	F	48-57	✓	3	> 100,000	P	HI
16	F	18-27		0	31,501-40,500	P	HI
17	F	48-57	✓	2	> 100,000	M	HI
18	F	28-37		0	45,501-60,000	P	HI
19	F	58-67		0	27,001-31,500	P-C	HC
20	F	38-47	✓	2	60,000-100,000	P	HC/HI
21	F	38-47		0	60,000-100,000	M	HI
22	M	28-37		0	31,501-40,500	P	HI

Table 4 (continued).

ID	Gender	Age Group	Married?	# Kids	Yearly Household Income ($)	TTM Stage	HV/IC Framework Classification
23	F	28-37		1	22,501-27,000	P	HC/HI
24	F	48-57		0	60,000-100,000	P	HI
25	M	18-27		0	18,001-22,500	P	HI
26	-	-	-	-	-	-	-
27	F	48-57	✓	0	> 100,000	M	-
28	F	38-47		0	45,501-60,000	M	HI
29	F	28-37		1	45,501-60,000	P	HI
30	F	38-47		0	60,000-100,000	P	HI
31	M	58-67		4	> 100,000	A	-
32	F	28-37		2	31,501-40,500	A	HI
33	M	38-47		6	40,501-45,000	P	HC
34	F	48-57		1	45,501-60,000	-	HC
35	F	18-27		0	60,000-100,000	P	HI
36	F	28-37	✓	0	22,501-27,000	M	HC
37	F	28-37		0	< 13,000	P	HI
38	M	48-57	✓	3	31,501-40,500	M	HC
39	F	48-57	✓	3	18,001-22,500	-	HC/VC
40	-	-	-	-	-	-	-
41	F	28-37	✓	2	27,001-31,500	P	HI
42	F	48-57		3	22,501-27,000	M	HI
43	F	18-27		0	< 13,000	P	HI

messages, and system logs show how CM functioned as a tool for building the community's capacity to eat healthfully. I first discuss the value and challenge of SMS and MMS (and consequently short electronic text messages and digital cell phone photos) as platforms for documenting and sharing one's healthy eating experiences. Second, I describe the way in which sending messages and using the CM Display helped participants reflect upon their personal capacity to affect healthy behaviors in the community. Third, I discuss how CM helped to specifically meet the needs of the community as described by participants. Fourth, I discuss the informational and behavioral impact that viewing CM messages had on my participants. Finally, I discuss how, surprisingly, the process of sharing messages was an important source of motivation to eat more healthfully for the message senders themselves.

6.3.1 Overall Results

Over the course of the study, 278 messages were shared by 40 participants (3 participants did not share any messages). As I mentioned earlier in this chapter, I moderated the messages to ensure that no offensive content was shared and that the messages met the standards provided to me by the YMCA. Seven of the messages shared did not meet the YMCA's standards and were not shown on the display (*i.e.*, because they discussed a weight loss program by name, energy supplements and protein powders). In addition, in 10 messages users attempted to send communication directly to me (not to the CM system), for example, telling me when the system was not working properly. These messages were also not shown on the CM Display.

Interestingly, HCs shared twice as many messages as HIs on average[14], though a One-way ANOVA showed that the difference between HV/IC group answers was not statistically significant. Still, one potential explanation for this difference is that HCs feel a greater sense of communal responsibility and thus may have felt more motivated to help others by sharing messages. A future study with a larger sample size would allow me to further investigate this difference.

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[14] HC participants: M=10.44 and SD=9.7; HI participants: M=5.72 and SD=4.1.

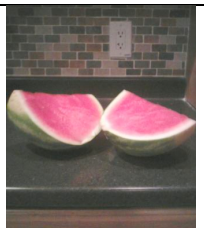
There was a range of submission frequencies (min=0, max=32) and the average number of messages shared was six. Eighty-five messages were shared in May 2010, 132 in June 2010 and 61 in July 2010. At the beginning of the study, participants sent a number of messages and then submissions declined until the CM display was installed (week 4 of the study), at which time submissions increased. A plausible explanation for this jump in participation may be that participants became more motivated to share once they knew that their submissions could actually be seen on the CM Display. After the display was installed, submissions increased for a few weeks and then started to decline. There was a spike in submissions again in week 9, after which time submissions began declining again.

Participants differed in how frequently they looked at messages on the CM Display. Seven stopped to look at messages eight or more times, seven viewed them 4-7 times, seven viewed them 2-3 times, six viewed them once and 11 people never looked at messages on the display. For those participants who looked at the display, most looked for a couple of minutes or more (n=21) while others looked for about a minute (n=2) or a few seconds (n=3). Of the 27 participants who had looked at the CM Display, 44% (n=12) said that they pressed the Community Response Panel buttons, 41% did not (n=11) and 15% were unsure (n=4). Thus, there was a mixed usage of the response panel buttons.

I analyzed the system logs to get a better picture of how frequently people interacted with CM. (My results are likely an underestimate as during the study, it appeared that sometimes, due to a glitch in the prototype, the system logs were not updated to include the most recent user interactions with the CM Display.) My analysis showed that messages were opened 1585 times over the course of the study. The Community Response Panel buttons were pressed 500 times and the "inspired" button ("I'm inspired to try this") was pressed more than the "learn" button ("I want to learn more about this") and "hope" button ("I hope others in the community will try this") ("inspired"=194 presses, "learn"=157 presses, "hope"=149 presses).

Overall, participants were enthusiastic about using CM in the future, saying that they would both still share messages (M=4.37, SD=.94) and view messages (M=4.39, SD=.87). Interestingly, while both HCs and HIs felt this way, HCs were more strongly

Table 5. Example CM Messages. Some of the most popular messages are shown, including who shared each message (PID) and the message's photo (if any) and text (if any).

PID	Message	PID	Message
P11	 Low fat yogurt without a lot of sugar!	P9	 These are great for quesadillas & wraps. They have 5 grams of fiber & 4 grams of protein.
P2		P19	Since participating in the community mosaic i have been a little more conscious of what i am eating and trying 2 eat more fruit
P18	 Healthy snack on the go!	P23	
P3	Lunch Salmon salad which consisted of (canned skinless pink salmon, low fat hellman's mayo, chopped onions, dill seasoning, pepper and sea salt) along with chopped romaine lettuce, vine ripe petite tomatoes and a boiled egg. It sure was tasty. I'm still savoring the taste.	P28	 I had the taste for something Western so I headed over to Jamaica Jamaica on Old National and got Ox tails, rice and beans, plantains and cabbage. To turn this into a healthier meal I divided it into 4 servings and added a salad or uncooked spinach, bell peper and celery to each serving. Result: A meal that someone would normally consume in one sitting became 4 servings for me and the nutritional value was greatly increased.
P30		P38	WHAT WE CRAVE MAY NOT NECESSARILY BE WHAT ARE BODY NEEDS. THE BODIES HUNGER FOR NUTRITION CAN BE CONFUSED WITH CRAVINGS. CRAUING FOR SALT SUGER AND GREASE. WE MUST FIRST PURGE OUR OLD ADDICTIONS

enthusiastic about sharing messages (*M*=4.78 for HCs vs. *M*=4.24 for HIs) and viewing messages (*M*=4.88 for HCs vs. *M*=4.25 for HIs), though a Multivariate ANOVA showed that these differences were not statistically significant. Like the difference in number of messages shared, this difference in enthusiasm about future use may be due to the HC values of communal responsibility and interdependence. However, a follow-up study with a larger sample size would be needed to see if the trends seen here were replicated in a statistically significant manner.

In the following sections, I provide more detail regarding participants' use of and reactions to CM. In particular, I discuss the extent to which CM was a useful tool for increasing the community's capacity to eat well.

6.3.2 SMS and MMS as Platforms for Experience Production & Sharing

My results highlight both the value and challenge of SMS and MMS as platforms for allowing people to document and share their experiences with healthy eating. In this section, I overview when, where and what kind of messages were shared and then discuss the value of conveying taste in messages. Next, I describe the usefulness of SMS and MMS, including the relative value of documenting eating experiences using text and photos. I then discuss the level of orchestration carried out by message sharers as they staged photos and prepared text. I conclude by describing the challenges that participants faced in preparing and sharing messages. This set of results provides answers to RQ2.

<u>When, Where & What Messages Shared</u>

As they sent messages to CM, participants shared a variety of foods that they eat to try to be healthy (see Table 5). Occasionally they shared messages about other topics (*e.g.*, exercising) or sent a photo of a food establishment (*e.g.*, Subway restaurant), but the majority of messages showed or described foods that the participants were eating themselves. Participants shared a range of dishes, including sushi, smoothies, kale salad, water, baked sweet potatoes, couscous, turkey bacon, grilled salmon, a tuna sandwich, collard greens, trail mix, Special K cereal and soy ice cream. Most participants did not simply send a text message telling others what they should be eating, rather they actually shared their current behaviors with others – giving them a real, personal example of how

to eat healthy. My content analysis showed that only 20% of messages were classified as *impersonal*[15], meaning that they contained no obvious indication that the message sender had tried the healthy eating strategy shared.

Participants shared breakfast, lunch and dinner foods as well as snacks and they sent messages before, during and after eating the food discussed in the message. Sometimes they shared foods that were examples of times when they chose a healthier alternative to what they could have otherwise been eating. For example, P8 discussed a message she sent about eating out at lunchtime:

> "I had a hard decision… Lunchtime is always kind of tricky and [in my message] I was just saying I was choosing what type of bread or what I was going to have. And I think I mentioned I was going to have a tuna on wheat, which was pretty much as opposed to having anything extra like condiments, like mayo and stuff. Just trying to keep it light on that particular day."

Participants shared messages in a variety of settings and the places they most frequently mentioned were their homes, workplaces and restaurants. They also described sending messages at the grocery store, in the car and at the YMCA. Interestingly, many participants felt that when they found a chance to share a message it was not disruptive to what was happening at the time. They seemed to be able to find times that were convenient for them to share messages; for some this was while they were at work whereas others found it easier to share messages from home. For example, P32 expressed her comfort this way,

> "Oh no it was [not disruptive. I sent messages] in a casual environment. It was not like during work or something like that."

The Importance of Taste

As participants shared and viewed messages, they focused not just on the nutritional benefits of foods, but also on the qualitative aspects of healthy food

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[15] Messages were classified as impersonal when they met the following criteria: 1) any text message that does not in some way indicate that the message creator has tried or is currently doing the strategy they mention (*e.g.,* "drink less soda" would be coded as impersonal whereas "I am trying to drink less soda" would not); 2) any photo message that only shows an item in the supermarket or elsewhere where it is not clear that this item is in the message sender's possession or that they are preparing to eat it (*e.g.,* if it is clear that the food is in their home or that they own it, the message is not coded as impersonal).

consumption such as taste of food. For example, eight participants spoke about trying to send messages that relate to the taste and flavor of the foods they were eating. For example, P3 tried hard to make sure that message viewers could replicate the flavor in the dishes that she shared:

> "I try to be detailed as to the type of seasonings I used … I was motivated to [include] the detail information…just in case they wanted, really wanted to try to prepare the food themselves. I try not to leave out anything so that they can at least try to have the same flavor."

P24 said that she was motivated to share, *"what I thought I knew best about – that's food and how to prepare it in a tasty and healthy fashion."* P34 was also concerned with making sure the foods she shared looked like they tasted good. She said,

> "I was eating a balanced meal that looked appealing [and] I asked my friends… 'Does this look good to y'all?' And they would say, 'Yes.' And I'd say, 'Okay. I'm gonna send this.'"

These examples highlight the importance of taste to many participants in the context of discussing healthy eating. These individuals discussed how they saw value in sharing foods that actually tasted good or looked like they tasted good. As health technology researchers, it can be tempting to reduce the management of eating to a purely biological process of trying to manage the type of nutrients consumed. However, it is useful to acknowledge that for some individuals, the taste and enjoyment of food is highly intertwined with thinking about how to eat healthfully.

Yet, in my content analysis, I found that few messages (11%) actually contained discussions of taste[16]. Thus, while some participants described taste as an important quality to convey, few people actually included such information in their messages. In the future design of health applications such as CM, it would be beneficial to examine user reaction to systems that better scaffold people in conveying the taste of the foods discussed.

Messaging as a Useful Platform

In interviews, most participants were vocal about the value of using the SMS and MMS platforms to send messages to CM (n=18; 62%). They indicated that it is relatively

[16] In my content analysis I applied the "taste" code to messages containing text that mentioned anything related to how the dish tastes (*e.g.*, describing a dish as delicious, sweet or bitter).

quick, easy and convenient to craft and send a message. Participants considered SMS and MMS convenient because instead of having to go out of their way to use a less accessible platform, their phone is a device that they typically have with them. As P3 said,

> "It was convenient because I keep my handheld device on me at all times, except for when I'm in the bed going to sleep, so to have it at hand's reach was very convenient."

P7 also discussed sharing her experiences on her phone, saying,

> "For me that's the best way, that's the best way. Some people may mention the Internet, but for me with the text on my phone that's the best, THE best way….Because I sleep with my phone, I wake up with my phone. My phone and I, we have a good relationship right now. A good marriage…. It's convenient and it's readily available compared to a computer – you have to go to log on, you have to attach a picture, it's just too many steps."

Being able to share messages via the cell phone also meant that sending messages when one is out and about was easy. As P16 told me,

> "I mean on your phone you can be out anywhere and you can be snapping pictures and sending them. I mean, it doesn't, you know take, too much effort to take a picture and send it. We do that everyday."

The convenience and constant presence of the phone can also help people remember to share. P6 felt that using a device that she frequently had access to meant there was less chance that she would forget to share a message:

> "Where as if you have text and phone, you capture it right there while you're thinking about it and there's less chance of forgetting."

Thus, overall, most participants felt that portability and constant presence of the cell phone, coupled with the simplicity of crafting and sharing an SMS or MMS message made sharing their experiences in CM relatively easy. Still, as I will discuss later in this section, some participants did face challenges when attempting to share messages.

The Relative Benefits of Photos and Text

Photo Message Popularity

The value of SMS and MMS was further discussed as participants talked about the relative benefits of sharing their experiences through text and photographs. Of the 278 messages shared, 53% only had text (n=146), 25% had photos only (n=70) and 22% had both a photo and text (n=62). In addition, I examined all of the message-opening events in the database and found that, messages with photos were opened twice as often as

messages that did not have photos (67% versus 33%). Thus, users, based upon their logged interaction with CM alone appeared more interested in looking at messages with photos. Some of this variation in use may be due to the way the CM Visualization was structured. If a message contained a photo, a small thumbnail image of that photo is shown as the building window – otherwise the CM logo is displayed (Figure 7). In the focus groups, some participants mentioned not realizing that building windows with the CM logo were clickable. In addition, the windows with photos were likely more enticing for some viewers than the windows that just had a CM logo. However, the rest of my results indicate that participants did actually feel that messages that contained photographs had significant benefits as compared to those did not.

Functional Qualities of Photos

Photographs were seen as having functional benefits but also a charismatic power in that they were inspirational and drew the viewer in. First, photographs helped message senders to not just describe the foods that they feel are healthy, but to actually show them more clearly. P1 described the value of sharing his experiences through photography by saying, *"a picture says a thousand words,"* and five participants described similar sentiments. These individuals felt that photos are an ideal way of getting their point

Figure 7. The CM Visualization Main Screen. If a photo message is sent, a thumbnail of the photo appears as the building window (a), otherwise if the message contains text only, the CM logo is displayed (b).

across. For example, P13 said that when sharing foods,

> "that people wouldn't think would be good, you know together as far as- as far as eating…I just want to show them a picture instead of just sending out a text, saying okay, 'Well, have granolas and cranberries together.' [I] just wanted to send them a visual, so they know how it look good together. It give them a- you know a idea of what I am talking about."

P32 said,

> "I think the benefits to using a picture message is that um, people see what the food is. Like I guess exactly what it looks like, versus just how it's been described on the menu. Like you really see what you're getting… So that's a benefit."

Showing the food in a photograph helped to remove some ambiguity regarding the healthy eating strategy that the message sender was trying to convey. This was particularly true in terms of helping viewers locate products in the future. For example, P11 said,

> "I think pictures are so great though.... Because like for this new product, one in particular, like I was at a fair on Saturday, and it was at Whole Foods, and it was for organic baby food and it's frozen organic baby food, but I don't think anybody's heard of it, it's called Jack- it was two companies, it was called Jack's Harvest and Yummy Spoonfuls, but nobody would've, you know, nobody would've known what the packaging looks like [if I hadn't sent a picture]."

Charismatic Qualities of Photos

In addition to helping convey their point, participants described the shared photographs as having a charismatic quality as they inspired and drew the viewer in. Four participants described how the photographic medium can help inspire people to go and eat something healthy. For example, P7 said,

> "I thought that through the picture alone, that they would be able to say hmm… 'I am going to go home and have some squash tonight as oppose to the French fries or as oppose to stopping at McDonalds.'"

P31 similarly discussed how seeing photos can help the viewer want to try the foods shared:

> "I wanted to see the pictures...They're more, you know, uh, enticing, more intriguing, you know, you want to try it, you know, if you see it you want to try it. Reading just doesn't kick in like seeing it."

An analysis of the system log data backs up the finding that messages with photos were more inspiring than those that did not have them. The Inspired button (in the Community Response Panel) was pressed a total of 194 times during the study. 48%

(n=94) of those presses were for messages that had photos and text, 36% (n=70) were for messages that had photos only and only 15% (n=30) were for messages that only had text. Thus, participants reacted most to messages that had photos or photos and text and very few reacted to messages that only had text. To put this in better perspective, the ratio of "inspired" button presses to message openings are as follows: messages with photos only=.15, messages with photos and text=.15 and messages with text only=.06. Thus, when viewing messages that had photos, people pressed the inspired button 2.5 more frequently than when they viewed messages with text only. It appears that while people find text to be valuable, having the photo component is useful for actually inspiring them to want to try the ideas shared in the messages themselves.

In interviews, many participants (n=12; 41%) discussed how – particularly as opposed to text – photos help to engender greater interest and draw viewers in. This may help to explain the fact that messages with photos were viewed twice as much as messages with text only, even though slightly more text only messages were sent than messages with photos (53% versus 47%). One of the main things that participants discussed was enjoying the vibrant colors that appear in photos. P15, for example, described seeing colorful photographs of fruit, saying,

> "those are the ones, the ones that were kind of bright, [that] kind of attracted me...to go look at them. Colorful, not necessarily bright but colorful."

Similarly, P9 said that,

> "the vivid color pictures, those are the ones that I think draw your attention."

P3 spoke about the draw that the colors in photos had on multiple levels and how they appeal to the viewer emotionally and mentally. Particularly when sharing food experiences, being able to see vibrant colors in photos can be valuable. For example, P34 said,

> "Everything should be beautiful and bright and just bam in your face. . . because that's what's attracting about food. You know, when you cook food, you like to have colors, green, yellow, red, you know? Things like that, so I think the more vibrant it is, the better."

Some participants felt that seeing a photograph in a CM message was what first made them want to actually read what the message sender had written. As P5 said,

> "When you actually see a graphic representation of something, I think it draws the eye in and then you wanna, it creates more interest and you wanna see what it's all about and see the explanation, see what the person had to say."

P28 went a step further to describe how pictures help to augment the text messages that people shared:

> "I think for me I would – because I'm a visual person, I would love to see the text with photos. I think that even when you're lookin' at [text messages with] recipes and stuff like that, I love to see the photos. So I think it's beneficial – I think that the visual, um helps to capture the interest more than if there's just a text."

Functional Benefits of Text

Though many participants felt that photos helped draw the viewer in, and though this is supported by the log data, participants also said that including text was necessary to help viewers fully understand the idea that they were trying to share. Just over half of participants (n=15; 52%) described ways in which including text in messages is beneficial. They felt that text is important to help get their point across and to help the viewer get enough information for the message to be practically useful for them. For example, if a user just sent a photo, participants were often unclear as to details such as the ingredients in the dish, how it was prepared or where it was purchased. P23 described her confusion over how a dish was prepared because it only contained a photo and no textual description:

> "I seen that fried fish [in CM]. . .I'm like, 'fried fish?!' But they didn't have no words on it so I said, is it fried? Or is it broiled?"

P9 discussed how, to help avoid the type of confusion expressed by P23, including text in messages is critical:

> "I felt like [all of the messages] needed an explanation and that is probably because I'm a really verbose person. But you know I felt like there needed to be an explanation of what people were looking at because otherwise you're looking at a picture and it's like, okay, why is it supposed to be healthy for me or why is that going to be tasty or why should I put these things together or where can I get them?"

P25 also discussed the value of including a text caption:

> "I sent a picture with text because I mean – if I just send a picture it'd be like, 'OK, it's good that he ate that, you know. No telling where he got it from.' So you know I put where I got it from and you know, how much I enjoyed it pretty much…I just believe in being thorough."

In summary, photos and text were both seen as useful ways of sharing healthy eating ideas. Both text and photos were useful for helping the sender to get their point across: photos were particularly useful for helping viewers to visualize exactly what they would be eating if they tried the idea in the message themselves. Text was particularly useful for helping viewers understand the details behind the messages shared. Photographs had a charismatic quality that helps draw and inspire users in way that text did not appear to be able to do. Thus, while text was very practically useful, photographs helped appeal to users in other ways.

Staging Photos and Preparing Text

While some participants indicated that they took photos without setting up the shot in anyway (n=8; 28%) or wrote their text messages as a stream of consciousness (n=6; 21%), most participants (n=18; 62%) discussed engaging in some level of orchestration when preparing CM messages by staging photos and/or investing care and consideration in the development of their text messages. For example, multiple people discussed staging the foods they were eating before taking a shot. This involved organizing foods and containers in a way that the message sender was satisfied with. For example, P16 said,

> "I'd first take like a couple pictures and I would see which one's best. Like I would usually use my oven, it's got like a little white, white backdrop kind of... So, I was like okay, I will sit it there and I tried to zoom in as far as I [could] to the actual item."

P4 specifically tried to arrange the shot in a way that would be persuasive:

> "I set [the photos] up how I think it would [be most] persuasive to someone that's trying to become more healthy and [trying to eat] healthy things. So I pretty much laid it out the way I thought it would be best."

Some participants were primarily concerned with viewers being able to clearly see what was in the photo and the point that they were trying to get across, such that the message was actually useful. For example, P5 was trying to be,

> "like a little movie producer. I mean, yeah, I wanted to, you know, be clear and simple to understand."

P9 had this to say:

> "I definitely tried to make sure the lighting was good and I definitely staged it a little bit. I mean it wasn't as if I wasn't eating what I took a picture of but, you know, like when I was showing the protein shake or if I had like a roll up on there and I wanted to show the hummus so if people went to the store they could visually have a picture of what they were looking for. So I definitely – whatever I took a picture of or something I was eating but I definitely tried to set it up so that you could actually see what you were looking at."

Other participants were concerned less with clarity and more with the aesthetics of the photo. P23 described trying to make her photo attractive to viewers,

> "I did stage the picture so that it could have a good presence when other people viewed it cause I was trying to make sure that [the food was] neat on my plate, make sure that I didn't eat any of the food before I took the picture or things of that nature."

Participants also described thinking about the text that they were going to send. Sometimes this simply meant reviewing their messages for typos and grammatical issues. Other participants actually took the time to think about the content they wanted to share in the message before typing something "off the cuff". For example, P10 said,

> "It wasn't something that I just was like, 'Oh, eat two apples and a banana and you'll be healthy.' You know, it was like, I thought about – thought about it because it was gonna be sent to people, they may take it to heart, say 'Oh, I'm gonna use this.'"

P10 was compelled to think seriously about what she was going to share because she knew that others would be viewing her messages. As with the preparation of photos, some participants were also concerned with the clarity of their messages or making them appealing to the viewer. For example, P38 said,

> "I want to convey the message. I want to convey it as explicit as I can. So I'm looking from [the viewer's] point of view, from their understanding too. To say, how can I make them, you know, have them see exactly what I see, what I'm saying through the words that I'm using. So I try to really be articulate."

P3 was concerned with drawing the viewers in by writing text that was tantalizing,

> "I tried to think… about a menu, like if I was at a restaurant and I tried to design the words that I used in that sense ... You know when you go to a restaurant, you look at a menu and they make the food look so tantalizing and savory and just appealing to the eye, I tried to think of it in that way, to appeal to an audience like if they were at a restaurant. Now I didn't always do that, but I tried to."

Thus, many participants engaged in simple evaluative thinking as they prepared their foods to be photographed and as they wrote their text messages. Through this process they assessed the way that foods were setup according to a number of criteria,

including clarity, usefulness, persuasiveness and aesthetics and appeal. This suggests that many people did not simply share their experiences without any forethought as to their benefit for and impact on others. To the contrary, the process of sending a message caused many to take a closer look at the foods they were sharing – even if just to assess something as simple as aesthetics. In this way, CM helped people take an extra beat – even if only for a second – to reflect on the foods they were eating. As I will discuss later, this was one of several ways in which CM led users to become reflective about their eating practices.

Challenges to Message Sharing

While most participants liked sharing their experiences via SMS and MMS, they did face challenges. Some participants lacked the capacity to share messages either because of the technical limitations of their cell phones or their own limited texting skills. In interviews, seven participants (24%) said that the poor quality of their phone makes it difficult for them to take and share photos or to send text messages. For example, some people complained that the poor camera on their cell phone made it difficult to take a high quality photo. Others said that their phone was prone to malfunction and sometimes did not complete the sending process when they tried to share a photo or text. Seven (24%) participants felt that their limited texting skills made it challenging to share messages and this limited the amount of messages that some users shared. Some did not know how to send text messages on their phone and others felt that it takes them a long time to compose a text message because of their limited texting skills.

People described other temporal challenges to messaging as well. For the most part, this revolved around eating their meal before they remembered to take a photo of it. Eleven participants (38%) described this happening to them, often because sending messages to CM was not on their mind when they sat down to eat. While I gave participants a sticker to place on their phones to remind them to share messages, if the sticker, or the phone for that matter, was not in their sight before or while eating, they would often forget to share messages. This was mainly an issue for people who tried to share photo messages. For these individuals, there was a short window of time within

which they could capture their experience photographically, since most wanted to take a photo that showed the food before they started eating it. For example, P34 said,

> "I'm thinking, 'Oh gosh. I'm eating correctly. I need to take a picture of this.' And, I'd be half through the meal, you know, so it was a [matter of timeliness]….It's kind of like when I was eating, it was like a missed opportunity."

In addition, even though many participants found SMS and MMS convenient and quick ways to share messages, some people still described how a lack of time led them to send shorter messages than they might have otherwise, or to not send messages as all. Indeed, some participants were compelled to send short text messages or quick snapshots not because they did not know how to send messages, but because it was more time efficient to do so. As P5 said,

> "It takes a little time to do that, it's kind of like a little mini project… so for me to really expound on it, I kind of [think to myself], well, I won't go into all that."

P28 deliberately decided to only send photos because text messaging took too long:

> "There were time when I was tempted to just send through images without a [text] message… So, sometimes…it was so much quicker…without, you know, having to find those little keys [on the phone to write a text]."

For P9, the time required to send a message meant that she thought to herself,

> "'I should take a picture of this,' and then I was like, 'I'm in a hurry, I don't have time to text,'… I feel like a solution to that would have been, for me, to take the picture and then go back and do the text when I had a chance and send it because it's not as though I needed to send the message right when I was eating the food."

Participants had mixed reactions regarding how difficult it was to remember to send messages to CM. Some felt that remembering was easy, for example, because they naturally remembered, got into the habit of sending messages, saw the sticker reminder on their phone, or because the weekly CM update messages served as a reminder. Still other participants found it hard to remember to share messages, primarily due to various life circumstances and responsibilities. They discussed being out of town, having to care for family members, the demands of their job and caring for small children as some of the distractions that caused them to forget or not be able to send messages. These more pressing matters took precedence in their consciousness and overwhelmed their ability to send content to CM.

6.3.3 Personal Capacity to Affect Change

Beyond the platform itself, my results also shed light on how CM proved to be a system that facilitated an exploration of the self whereby individuals gained a sense of self-efficacy and self-worth with respect to their ability to help others in the community to eat well. Participants felt confident that they know enough about healthy eating to help others, that they had important ideas to share, that their ideas were valued and that they actually impact the community for the better by sharing their ideas.

Self-efficacy

By examining the pre- and post-intervention surveys, I found that participants felt more strongly that they know enough about healthy eating to give advice to friends and family[17] ($F(1,32)=8.53$, $p < .05$) and people in the local community[18] (though this change was not statistically significant) at the end of the study. Horizontal individualists (HIs) had a bigger increase than horizontal collectivists (HCs) in the positivity of their answers to the survey question, "*On a scale of 1-5, say whether or not you agree with the following statement: 'I know enough about healthy eating to give advice to people in my local community (e.g. neighbors, people that go to the YMCA).'*" While HCs increased by .22 points, HIs increased by almost double that amount: .43 points[19]. While HIs and HCs started out pretty close in their confidence about giving healthy eating advice to the community, in the end, HIs felt slightly more confident in their ability. While these differences were not statistically significant, they do present an interesting trend. In a future study with a larger sample size, it would be useful to examine to what extent a community-based health information sharing system is more effective at improving the confidence of HIs as compared to HCs.

The increased confidence shown in the survey responses is further backed up by the sense of confidence participants discussed in the interviews. Participants described

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[17] The mean answer for this question went from $M=3.95$ to $M=4.26$.
[18] The mean answer for this question went from $M=3.87$ to $M=4.19$.
[19] The mean answer to this question for HCs went from $M=3.78$ to 4 whereas for HIs, it went from $M=3.81$ to $M=4.24$.

how CM helped them to feel more important and valued with respect to their opinions around healthy eating. First, I examined to what extent participants felt that they had useful ideas to share in CM. Most (n=22; 76%) said that they felt their messages would be useful, for example because they had personally tested the idea in the message themselves, because the healthy foods they shared were tasty, because they were thorough in their message or because the idea they shared was based on previous nutritional knowledge that they had obtained. Though they were not health experts, these individuals felt that they had important things to say about how to eat healthfully. As P13 put it,

> "I mean I am not nutritionist but you know I've kinda gotten some ideas on like, you know healthy combinations, things to put together."

P8 felt similarly confident that she was positively contributing to the healthy eating practices that CM helps advocate:

> "I felt pretty confident with the messages that I sent because I knew, like I said, most of the [messages I sent were] geared towards motivating how to do nutrition and health as a lifestyle. So most, mainly all of my messages…contributed towards the cause."

Furthermore, just over half of the participants I interviewed (n=15; 52%) said that they did not feel self-conscious about sending messages. P33 said that he was not worried about what others might think of his messages because he was confident in their quality:

> "I mean they were, like I said, they were good [ideas]. I felt they were good [ideas], you know. Good, you know, healthy decision making [ideas]."

In addition, the anonymity of the CM system helped some people feel comfortable sharing messages. As P19 said,

> "Nobody was gonna see my picture and nobody was gonna see my name, so I didn't care. Which, that was good too, I guess, in a way. So you're more kind of like, when nobody knows where these messages are coming from, you're kind of like more free to send them and speak your little mind."

<u>Self-worth & Belief in One's Impact</u>

The finding that after using CM, participants felt increased confidence in advising others about healthy eating is also supported by the sense of self-worth that participants described feeling when sharing messages, seeing them on the CM Display and when seeing others' reactions to their messages.

Having One's Voice Be Heard: Sharing Messages

First, nine participants described feeling a sense of pride and importance when sharing messages, feelings that were engendered as people had the opportunity to have their voice be heard within the community and to feel that they had something valuable to say. For example, P6 spoke about the enthusiasm she had when she felt she had something of value to share:

> "I would get the [weekly SMS] update, It would come at work and that would remind me to send something that day and I, you know, would just try to do something later on. Especially if I thought I had something that was really healthy, [where] I thought, 'Hey this is a good suggestion, I would be proud to send this to the Community Mosaic.'"

CM, like EatWell, was valued as a platform for having one's voice heard in a way that was not previously possible. A comment made by P6 helps put in context the value that such a platform has for the Southwest Atlanta area:

> "I don't live there anymore, but I have lived in southwest Atlanta for a long time. And I've done, I've done other health things like at the Y and worked with some of the people who you know have been concerned about the community. And I'm really concerned about the south – the southwest community because um, people tend to not have a voice there or they don't use their voice there."

While P6 felt that the voice of the Southwest Atlanta community is not typically heard, some participants described the way in which their voice was heard through CM. As P1 said,

> "I really just wanted people to hear my thoughts on what actually is healthy. .. I also thought it was – it was a great opportunity to get my voice to be heard, have my opinions out there… I get to put up what I think is important, as opposed to always having to, you know, look at things that other people think is important."

The Value of Public Visibility: Seeing One's Messages on Display

Because CM makes users' ideas publically accessible, the system gives greater visibility to these ideas. This visibility helped participants feel that their ideas were being valued. Speaking about his messages, P12 said,

> "It's just nice to know they're up there and anybody and everybody could value my little opinion."

Similarly, P43 described being excited that others were interested in her ideas. Furthermore, actually having the opportunity to see their messages on a large, public display was exciting and helped some participants to feel important. As P1 said, for him,

"*it's like being famous…the whole thing reminds me of a billboard."* P3 felt similarly when she saw her messages on CM:

> "It was like, you know, seeing an original piece of my own art based on how I described food….I was excited. I felt published…. Because other people could see my ideas."

Other participants also echoed the excitement and pride that P3 exuded. For example, P12 said,

> "It was fun. I mean you always want to see yourself, you know what I'm saying, be like, hey, you know, I wrote that, you know, that's mine. Like, you should try that, you know."

Impacting Sense of Self-Worth: Seeing Reactions

In addition, as participants saw the reactions to their messages, they gained even more opportunities to get positive feedback. In fact, ten interviewees (34%) described specifically looking for people's reactions to their messages. Furthermore, ten participants (34%) discussed how they appreciated seeing people's reactions to their messages (in the weekly SMS updates and on the CM Display) because it was validating and showed that they were having an impact. As P12 said,

> "that's always fun, you know, it's always nice to know that somebody listens to you."

Similarly, P22 said,

> "that's very useful to know that you can inspire people with you eating habits."

P32 discussed appreciating being able to see the number of people who had pressed the Community Response buttons:

> "I liked it because… it let me know that, you know, somebody looked at it and I inspired someone to say, you know, I've never tried that, you know. Just, you know, yeah, let me try that one. I, you know, I may not have tried anything else but I'll try that one and it's - it's reaching out to one person and even though all it says is one person [was inspired to try my idea], you know – [it] inspires one person to do it but, um, you never know what that ripple effect may have. Like if, you know - if I'm inspired to do something then ultimately, there are going to be four people that try it even though it inspires me because I'm the person that cooks in my house. So, me, my kids, you know, my husband, we're all going to eat what I cook."

P28 described seeing how many people were inspired by her messages in the weekly SMS update:

> "I was very impressed! I was definitely very impressed…You always wanna know that your ideas are good and that they're accepted, you know."

The interview data showing that numerous participants felt their contributions were being valued is further substantiated by my survey data. The post-intervention survey responses showed that participants felt strongly that they help to improve the health of the community by sharing messages in CM (*M*=4.19, *SD*=.97). Upon further examination of this data, differences between HCs and HIs emerged as HCs responded more enthusiastically to this question than HIs (*M*=4.5 for HCs, whereas v *M*=4.1 for HIs), though this difference was not statistically significant. Still, these differences are consistent with the HC orientation, which sees the value in interdependence and cooperation. However, overall, both HIs and HCs saw the value in using CM.

The themes presented in this section and the accompanying examples show the positive ways in which CM helped to build up the individuals within the community – to help them feel important and that they have valuable ideas to share. In so doing, CM helped to contribute to the community's capacity to help improve the eating practices of others. These findings provide insight into how technology can help to give people the encouragement to be lay advocates for health within their community.

Limits of One's Effectiveness

At the same time, nine participants (31%) did describe feeling unsure as to whether or not they were helping others by sharing their messages. One of the reasons is that the CM Display frequently stopped working during the study, due to software glitches, network connectivity problems, thefts of the WiFi adapter and people closing down the application inadvertently or purposefully. As P3 said,

> "It's kind of hard to say because [the CM Display] wasn't working, if I can't see it then I don't know if it's so much helping the community, technically speaking, but if it was available, I could see it being a big benefit."

Others were unsure how much their messages really got through to people. As P11 said,

> "I don't know, I hope I'm helping a little, I hope that, you know, my ideas are good, [that] people, other people also find them helpful, but I don't know if, I don't know if they take it to heart enough."

P11's quote highlights the fact that ultimately, as other participants told me, message senders' ability to help others depends on the people viewing the messages. As P5 said, while it is beneficial to share healthy eating ideas,

> "It's up to the individual to actually go do it, so you can have knowledge, but if you don't follow up, then knowledge is really not helpful."

P14 also discussed the responsibility of the individual viewing the message,

> "I think it's based upon the individual - how the individual wants to eat, and it might help and it might not help. Some people get to talk all day long about healthy eating, but if you don't have that mindset, it doesn't matter what's being said or what you're reading."

P22 similarly said that while he can share his eating experiences with others, it is up to the person looking at his messages to make changes to their behavior. These participants' responses echo the comments from the formative focus groups that I conducted. While talking about health may have some value, in the end participants felt that it is critical for people to move towards making changes to their behaviors. Later in this chapter, I discuss the extent to which CM helped to facilitate such action.

6.3.4 Counteracting Challenges by Meeting Community Needs

In this section, I delve more deeply into the ways in which participants felt that CM was a useful platform for specifically meeting the needs of the community surrounding the YMCA branch where I conducted this study. I first describe the healthy eating challenges that participants described as being prevalent within the community and overview how they felt CM countered these challenges. Next, I describe the collectivistic motivators that encouraged participants to share messages in CM. I conclude by discussing how participants countered the draw of unhealthy foods in the area by helping to saturate the community with healthy eating ideas. These results helped to answer RQ3[20] by highlighting the value that participants saw in using a system like CM to counteract the unhealthy food advertisement and availability within the community.

Community Needs

As I interviewed participants, they described challenges and needs related to healthy eating both locally and within the African American culture more generally. For

[20] RQ3: In what ways does accessing the nutrition-related commentary of local community members affect how people conceive of the state of health in their community?

example, they expressed concern over the prevalence of diet-related health problems such as diabetes and high blood pressure within the African-American population. As I discussed earlier in this dissertation, the disproportionate existence of these problems amongst African Americans is well documented. Other participants spoke about the abundance of fast food and the challenge of finding healthy foods in their community. P6 discussed this challenge and how CM made her more aware of it:

> "There is an over abundance of fast food places… There's not the quality as it relates to food, even in the grocery stores. I think that that could be improved… when I look around in the community, the healthy choices for you know like peak restaurants and places to eat are just not there and by having something like [CM] visible, it just, it makes me think I don't want to eat at a lot of the places that I see in this community; I may wanna, maybe cook my own food or maybe just not eat out as much. Because I don't see a lot of the places in this area that look like the foods that are on the [CM] display."

P8 also described environmental challenges to nutritious eating:

> "Trying to look for healthy alternatives is very hard. I remember recently, this week, I was trying to find something quick without having anything greasy and realizing that there is nothing available when you're just trying to get anything. And I think it might have to do with the area which you may live. But eating healthy could be a challenge at times because of limited, like restaurant options of what you could eat and what you want to eat….I live the suburbs of the city of Atlanta, near southwest Atlanta. Most of the restaurants are—if it's not chicken or a burger joint it may be a pizza joint…Eating in my community has always been hard because of the demographics, because of the race of people that lives in my community, and so the options, again, are limited. And it's harder to eat a certain way if it's not available."

P8's quote highlights the challenges she faced because of where she lives. She also alludes to the fact that the racial makeup of her neighborhood has meant that access to healthy foods is limited. Her presumption is supported by a number of studies that show that predominantly African American neighborhoods typically have fewer grocery stores than predominantly Caucasian ones, even when controlling for income (Morland et al. 2002).

Beyond discussing the challenges in the community, many (n=13; 45%) participants talked specifically about how CM specifically helped to address these issues. In particular, they discussed how the presence of CM in the YMCA is a reminder of the importance of healthy eating in the face of all the unhealthy options in the community. P18 put it this way,

> "It's important from a cultural standpoint too, I think, for this community to ah, to kind of have it to take a glance at it and be reminded, cause I think from a cultural standpoint…in this area, there's a lot of unhealthy um, fast foods, so, um, you know, a lot of people depend on those type things, so [it's

useful] to kind of have something to kind of remind you maybe, to you know if not stay away, at least limit the consumption of those things is important."

Participants also discussed how CM was a source of healthy eating options in the face of the plethora of information on how to obtain unhealthy foods. For example, P9 said this about CM:

"I think it's a really valuable—I just think the community needs to have that source of input. I mean it is information and it is educational, you know, it's just [information that's] not out there right now. The information that's readily available to the people in this community, I feel, are, you know, we can get a really good deal on, you know, either fast food or wings or Chinese. I mean that's what people are inundated with. If you drive down some of the main streets in the community there's not, you know, really a source of improving, you know, information encouraging you to improve your health or making those resources available to you."

The following sections provide more insight into participants' collectivistic motivation to share ideas in CM and the ways in which message senders attempted to saturate the community with ideas.

Collective Motivators

Twelve participants (41%) specifically described how a primary motivator for sharing messages in CM (beyond being in the study) was to encourage others in the community to eat healthier. To be a contributor in the CM community and thereby have the opportunity to encourage others meant that CM users had to eat well themselves and then share these behaviors. This tie between their behaviors and their ability to participate in CM is encapsulated by P34, who said that using CM, *"made me eat right so that I could have a picture to send to the kiosk."* Participants desired to show others that it is *possible* to eat healthy and *inspire them to want* to engage in positive behaviors. For example, P12 discussed wanting to show people that it is possible to eat healthfully, saying that he hoped,

"Somebody will get something from it – someone, somewhere, sometime will take what you say and be like, oh, I understand that, yeah, I can do that."

Other participants discussed wanting to show people that it is not as difficult as one might think to eat well. As P9 said,

> "I need to share more but I think that contributing makes me feel like I'm doing a significant amount because, you know, I'm – I feel like I, you know, have a decent amount of knowledge to share and [if] people can see that it's easy, not that hard to do, then they'll be more motivated to do it."

Participants also discussed sharing messages in an effort to peak others' interest in eating healthfully. For example, P13 discussed how for her, trying to inspire others through CM was a natural extension of the campaigning for health that she already does in her social network:

> "I'm always talking to friends or family about, you know, try and change their eating habits, you know, as you get older, you can't, you know, you can't eat stuff like you use to. Like I can't drink milk like I use to, but I do try to talk to family and friends about, you know, slowly changing eating habits and sometimes I fall off the boat, but I like to be, you know, kind of an inspiration to people, so that's something that I kinda wanted out of this also."

Some people were satisfied with influencing even a modest growth in healthy eating interest in their community. As P6 said,

> "If I only provoke one person to do something different. If I can just inspire one person, then that's one person and me… [I'm] just trying to encourage people to do things like, to get away from fried foods eat fresh, eat lettuce."

Saturating the Community with Ideas

In line with the design goal of CM, one of participants' main motivators for sharing messages was to provide others with ideas for eating well. My post-intervention surveys showed that after using CM, participants felt significantly more strongly that it is important for them to give healthy eating advice to friends and/or family (3.74 to 4.29, $F(1,32) = 11.91$, $p < .05$). This finding suggests that using CM helped participants to see the value in helping others to eat healthfully. Indeed, as I discussed previously, many participants were motivated to use CM to inspire others in the community to eat well. Thus, while my findings cannot show this conclusively, having the ability to see the value in sharing healthy eating ideas in CM may have helped participants to see the value in sharing health advice more generally amongst their social network.

Both before and after the CM intervention, HCs felt much more strongly that it was important for them to give healthy eating advice to their friends and family, something that one might expect given the nature of the collectivist orientation. In response to the question, *"On a scale of 1-5, say whether or not you agree with the*

following statement: 'It is important for me to give advice about eating healthfully to my friends and/or family'", both HCs and HIs responded more favorably to the question post intervention, but HCs slightly more so: the average answer for HIs went from *M*=3.6 pre-intervention to *M*=4.24 post-intervention and HCs went from *M*=4.11 to *M*=4.44. Interestingly, the gap between the responses of HIs and HCs was smaller by the end of the intervention (.51 pre-intervention vs. .2 post-intervention). Thus, after using CM, HIs and HCs were on a more even level in terms of how important they felt it was for them to encourage their friends and family to eat well.

My interview results provide more insight into participants' interest in advising others to eat healthfully. Thirteen participants (45%) discussed the ways in which CM is a useful platform for helping to saturate the community with ideas for how to eat well. For example, some participants said that CM helps facilitate information dissemination in a new way. As P12 said,

> "It gives another avenue to use that we didn't have to us previously. You know, if we only had word of mouth and after awhile that kind of dies down... [CM is a] new, you know, way to get information across for others. So you know, it's another option that we have. And, the more options we have, the better we tend to do um, in our quest for eating healthier."

P31 discussed how, as a new platform for information sharing, CM provides community members with more opportunities to be exposed to healthy eating information:

> "Anytime you can put something out there it's a benefit to our people. Because the more we saturate them with facts, the more opportunities they have to at least think about it. That's what I think. Even if they don't do it. We just need to present it. And the more it's being presented, the more it affects you the more you think about it, the more it becomes you know, part of your being I think. Because ok when you look up at the sky and see clouds you think it's going to rain. So you know, you start to think like that: you say, yeah if I eat good I'll be healthy… And if you just keep impacting people with that I think it'll have an impression."

Other participants described the value of CM in terms of how it supports the sharing of realistic examples of how people can eat healthy. For example, P6 said that helping others to see what she was doing to be healthy, "I think was good. They see a living example, instead of listening to an ad." Some of these realistic examples included giving people practical alternatives to eating unhealthy fast foods. As P7 said,

> "I think we are ones that spark change….and I think with that machine, that gives us the opportunity to, you know, to kind of spark different ideas….we have to change one at a time: as oppose to going to Wendy's and getting that .99 cent burger, you know, we have to- if we have something constantly

> giving us ideas say well, you know what, let me just go to Publix and get [something], or Subway and get a sandwich with lots of vegetables as opposed to a .99 cent [burger]. Or just go to Publix and get the small, little thing of tuna and some crackers, that will be a little healthier or something of green or a .99 cent side salad at McDonalds. Things like that is what I'm referring to....So, by seeing that, I think that kind of… gives us ideas to make better choices."

Local & Cultural Contextualization

Recall that in my evaluation of EatWell, I found that the audio clips often spoke about local establishments, but that participants rarely spoke about cultural foods. I conducted a content analysis provides to further examine the extent to which CM messages contained locally and culturally contextualized information. I found that, like in the EatWell study, very few messages (8%) described foods that are a traditional part of African American, African or Caribbean cuisine. While my data does not provide an explanation for this trend, plausible explanations include participants rarely consuming these foods or having few ideas for how to prepare such foods in a healthy manner. In my future work I hope to examine this phenomena in more detail, to better understand if systems should try to more specifically support users in sharing cultural food ideas.

While I saw similar patterns of cultural food discussion in EatWell and CM, I did not find analogous trends around the discussions of local establishments. In CM, while a number of participants shared photos of, and described foods obtained from local establishments, very few messages mentioned these establishments by name (15%). While my results do not indicate why this pattern emerged, one plausible explanation is that many of the messages shared appeared to be photos of foods that participants were preparing at home. In my future work, one way to extend CM would be to build scaffolding into the system such that users are encouraged to specify the locations of places they eat, either manually or automatically (*e.g.,* by leveraging the GPS features on their phone to share their location data).

Innovation

CM was not simply useful for sharing basic information about healthy eating (*e.g.,* saying that it is important to eat vegetables). Many participants described how they chose not to just send mundane healthy eating ideas, but to share more innovative and

creative foods that YMCA members may not have been previously aware of. P13 discussed how when viewers look at CM, it teaches them,

> "different things to eat instead of like, you know, the basics, apple, orange…Like making your own granola, a smoothie, just different types of, you know, cereal, things you can just mix together…There are some things people wouldn't think are healthy, but they are."

Participants discussed sharing places, snacks and meals that were out of the ordinary and that may have been outside of message viewers' normal routine or repertoire. For example, P11 said,

> "If there's a new product or like if there's a new place that I tried for lunch, or something that I, that wasn't routine for me, that I thought was helpful, then I would include that."

Similarly, P9 tried to share foods that she felt,

> "people might not think of, you know, like, like I do a protein shake and it's one that doesn't—it's all organic and has sweetened with Stevia [a natural sweetener] and things like that. So I tried send things that I thought would be helpful to people."

In addition to highlighting new ideas for what to eat, some people shared creative ideas for *how* to eat. For example, P28 said,

> "I sent [a message] about…that Jamaican restaurant and what I normally do is, I normally just take the meal and divide it into three servings and then just add veggies or a salad with each serving. So I thought that's a good way because a lot of times when we eat out the portions are so large and we feel like we have to just consume all of it. So I was just hoping that maybe a thought might inspire someone to realize that there's a different way to do something."

P4 was motivated to share messages that reflect her vegetarian lifestyle:

> "I grew up as a vegetarian and now I'm trying incorporate the same thing with my kids, my kids are vegetarians as well … I figure, you know most people in the South, they eat a lot of soul food, they eat a lot of fried food, so I wanted to display something that was a little bit different from what they were accustom to."

These quotes are indicative of how participants did not mindlessly share whatever it was that they were eating, but took care to try and share more innovative ideas that might help expand viewers' understanding of how to eat healthfully. P1 saw CM as a good platform for sharing ideas that people may not have otherwise accepted,

> "I decided to send stuff that normally people probably wouldn't take my word for. … stuff that's kind of out there, very exotic stuff that's not normally found in regular places…. I also want to send stuff that's really outside of their – our – ordinary scope of things. ... In fact, you can't even go to any major

food retailer and just find goji berry juice, or goji berries for that matter. It's a very exotic, you know, healthy food."

In summary, many participants used CM as a platform for helping to expose the community to new ideas and give viewers a fresh perspective on how to eat healthfully. Furthermore, this desire to expose others to novel and exotic ideas may be one reason why traditional cultural foods were not discussed very much.

6.3.5 The Informational & Behavioral Impact of Viewing CM Messages

In this section I move beyond a discussion of message senders' intentions and motivations for sharing messages to unpack how effective CM was at helping participants gain useful healthy eating ideas and make positive changes to their eating behaviors.

Information Acquisition

I begin by describing the extent to which participants gained healthy eating ideas by viewing CM messages and then discuss their perceptions of the quality of information shared. I then describe participants' thoughts around being able to challenge the ideas presented in CM. I conclude by discussing challenges that participants faced in obtaining information from CM. My results helps to answer RQ3b by highlighting how well CM helped improve users' understanding of how to eat well in the community.

Learning New Ideas in CM

My post-intervention survey results showed that all participants that viewed messages on the CM Display felt that the messages were somewhat useful or very useful. In my interviews, 14 participants described learning new or useful healthy eating ideas as they viewed messages in CM. They discussed having their interest peaked by discussions of various fruits and vegetables, organic products and new places to eat. Furthermore, participants discussed learning new ways to prepare foods, seeing meals that they would have never thought of making and even being exposed to dishes that they had never heard of. For example, P13 said,

"I like the community approach, because everybody has their own ideas and I saw some things on there I had never even heard of... Like the stuffed grape leaves….I didn't know what that was when I looked at it, so, you know you never know what you can gain from other people."

P3 also discussed having her thinking expanded in terms of what she can eat to be healthy:

> "Some of them fruits that they had were different than what I normally would have tried… And then some of the Caribbean dishes, tropical dishes, I like different types of foods, and it gave me an idea of oh yeah I can eat that. That's not [too full of] fat and calories or a lot of grease [isn't] involved because it's grilled or it's baked or smoked or whatever."

Thus, for many participants, seeing messages in CM helped them move beyond their current arsenal of healthy dishes. As P5 articulated, they learned practical ideas that they could use themselves:

> "It was encouraging that you could um, take some of the ideas that you saw and incorporate 'em in your um, at home, you know, when you cook and go [shopping]."

Perceptions of Information Quality

Overall, survey responses showed that post-intervention, participants felt slightly more strongly that people who go to the YMCA can give them useful and truthful healthy eating information (M=3.43 to M=3.76), though this difference was not statistically significant. Interestingly, HCs and HIs differed in their responses to the pre- and post-intervention questions about this topic. First, pre-intervention the response for HCs was slightly higher than that for HIs (M=3.78 for HCs vs. M=3.24 for HIs) to the question, *"On a scale of 1-5, say whether or not you agree with the following statement: 'Overall, people that go to the Southwest Atlanta YMCA on Campbellton Road can give me useful and truthful information about how to eat healthfully.'"* However, at the end of the study, the response for HIs to this question rose more drastically than it did for HCs, whose answers barely changed. By the end of the study, HCs and HIs responded with roughly the same average rating: HCs went from M=3.78 to M=3.89 and HIs went from M=3.24 to M=3.81. One explanation for this shift might be that people with a collectivist orientation would naturally be more inclined to see the value in advice from others in the community whereas individualists might be more skeptical. It may have been the case, then, that by seeing others share useful information in CM, HIs gained an increased belief in the value of the healthy eating ideas of others in the community. As my study was not a controlled experiment, I cannot say conclusively that this attitude shift was due to the use of CM. However, my interview results further back up this point, as they show the

positive reaction that many HIs (and HCs) had to the ideas they saw shared in CM – saying that the messages gave them encouragement, motivation and ideas to help them eat healthy, and that CM helps counter the barriers to healthy eating in the community.

Challenging the Content Shared

Currently, CM provides a limited way for viewers to share their reactions to messages through the Community Response Panel buttons. I spoke to participants about whether or not CM should allow people to share more detailed critiques of the messages. The reactions to this topic were mixed, with some people feeling that it would be beneficial and others feeling that it would be detrimental. Participants who were in favor of more detailed critiques felt that such feedback would allow for a more diverse set of opinions to be shared. For example, P28 said that having a mechanism for greater feedback,

> "might have been helpful. I mean I guess then you know we could have seen- had both sides to it, you know, cause I am sure that everybody didn't like everything that they saw. So, um, I think it would- I think you know feed back from both sides would be good."

Allowing for feedback, then, might help provide a more balanced picture of the message shared, allowing the viewer to see that even though the idea was shared, it may not necessarily be something that everyone in the community agrees with.

At the same time, some participants felt that allowing critiques would be negative. These participants wanted CM to continue to be a positive fixture in the community and that supporting more detailed critiques would pave the way for the sharing of negative reactions to CM messages. Many participants were wary of this shift towards negativity. As P3 said,

> "If they have legitimate reasons as to why it's not healthy and they can explain why, but you're going to have people that are going to complain about things just because they're not happy or they just want to complain. I don't think that that board should give too much criticism or have the flexibility to give too much feedback on criticism because it's supposed to be a positive thing for our community… I think that would take away from the positive perspective or idea it think you're trying."

P12 also spoke about the way in which critiques could take away from the positivity of CM:

> "I mean that kind of opens the door for some negative, uh negatives comments, that you know, I really would, really wouldn't wanna read. ...Cause everybody's entitled to their opinion, right or wrong, it's

> still your opinion and I don't have to challenge your bravado on you know, such a positive space. . . If you have a negative, you know, like my mother always says, 'If you don't have nothing positive to say, then don't say anything.' ... Nah, I don't think there's really a need for critiques."

Participants also described how critiquing ideas could discourage message senders and prematurely discourage message viewers from trying out the ideas. As P32 said, someone might dislike a message simply because of their own taste preferences – not on the basis of the healthiness of the message. In this instance, if they shared their negative reaction to the message, other viewers could be turned off and kept from trying something that they might like.

Thus, participants had varying feelings about the place that critiques should have in CM. Overall, participants wanted to ensure CM remains a positive space and that if any more detailed feedback is provided, serious care should be taken to ensure that the feedback shared is constructive and does not unnecessarily discourage viewers from trying healthy ideas.

Challenges to Gaining Information in CM

As I have discussed in this section, participants described various ways in which they were able to gain new healthy eating ideas through CM. The post-intervention survey results support this finding. On average, participants felt that they learned new ways to eat healthfully by using CM (M=3.47, SD=1.22). While the average response was above a neutral rating (3), the response was not as strong as it could have been. Indeed, my results also highlight the ways in which it was sometimes difficult for participants to gather useful information in CM. For example, when interviewing participants, many said that they had seen useful ideas in CM but often had a difficult time recalling the specific strategies that they saw. This indicates that while CM may have had useful information, it was not as successful as it could have been at helping that information stick with participants. For example, P12 described a dish he vaguely remembered:

> "One of them was a chicken dish. Um, a skinless chicken dish, if I remember with some um, a side, I can't remember."

Some participants remembered components of the messages they saw but forgot certain elements while other participants had trouble recalling any details of messages they saw

at all. This challenge clearly suggests the need for a future system of this type to provide mechanisms that better support users in remembering the ideas learned, for example by allowing them to take a digital or physical copy of the message away with them after visiting the display. Indeed, in the interviews, six participants wanted to be able to make notes about what they had seen in the display.

Another challenge was that 11 people described how their interaction with the CM Display was limited either because they were not going into the YMCA much or because the display itself was not functioning. Some participants simply had reduced the frequency with which they were visiting the YMCA and others were out of town. Seven participants said that because they were not able to use the CM display because there were numerous instances in which it was not functioning. Indeed, the CM Display was unfortunately not working numerous times during the study due to system glitches, theft of system parts (namely the WiFi adapter) or people tampering with the system accidentally or purposefully (*e.g.,* finding a way to close the CM Display Visualization). These findings are further supported by my system log analysis, which showed that CM was functional and used for 25 of the 44 days that the Display was at the YMCA. Furthermore, my post-intervention survey data showed that eleven participants never viewed the Display.

Thus, participants who had limited interaction with the system had fewer opportunities to gain healthy eating strategies from CM. Future work could address this issue by making the CM message content more accessible to users outside of the YMCA. In this study, I chose to restrict message access to the YMCA, a community-focused institution, to help reinforce the fact that CM's goal is to help improve the health of the community. However, the reality of people's schedules suggests that providing access to CM messages outside of the YMCA would be beneficial. Indeed, participants described a desire to be able to access CM from a PC or to be able to see CM messages on their phone. For example, P33 said that when,

> "you're like at the kiosk, um, if you could send things back to your phone, like if you could send the messages that you pop up – say I would like to send that one to my phone or whatever and put your number in there and it goes to your phone. That could be… something, you know, helpful in a sense."

P5 discussed the benefit of having access to CM on a desktop computer:

> "Of course a computer would be much more useful because you have more- it would be flexible and it would be more to your schedule than you having to actually go to a very limited place where you might not even go that, you know, in a certain time period. So yeah, the computer would actually be better."

Other improvements would include installing a display that is more tamper-proof and refining the system software such that it has fewer bugs and is more tolerant of lapses in network access.

Messages Motivating Action

In the previous section I discussed how, though they faced some challenges, many participants learned new healthy eating strategies. I also examined the extent to which CM actually motivated participants to eat well. The post-intervention survey responses showed that participants felt that using CM made them want to eat more healthfully or continue to eat healthfully (M=4, SD=1.15). These responses were further supported by the interview data as participants discussed how viewing messages helped encourage them to eat more healthfully.

Furthermore, beyond being motivated to eat better, I examined to what extent participants actually began to engage in behavior change by eating healthier foods. In my analysis of the post-intervention survey data, I found that 47% of participants tried messages that they saw in CM. This result must be taken with a grain of salt, however, because some participants may have meant that they had generally eaten foods shown on CM, not that seeing the messages was what led them to try the foods. This ambiguity represents a limitation of my work, as the wording of the survey question that asked participants if they had tried foods seen in CM was not clear. In a future evaluation of CM, I would modify the survey to more explicitly and clearly ask if viewing messages led them to try new foods. Still, in their written explanations of their answer to this question, many participants discussed specific foods they had tried. For example, P7 discussed trying a salmon dish that she had seen, noting that it did not turn out as good as it looked in the CM message photo. Other participants discussed trying the smoothies, nut mix, turkey bacon, wheat waffles, vegetables boiled in seafood seasonings and tabouleh salad shared in CM. In interviews, six participants discussed trying ideas they saw in CM and two others discussed planning to try CM messages. For example, P9 described being reminded to get one of her favorite dishes:

> "A lot of the stuff was stuff I was already doing. Although it did make me go out, yeah, it did make me go out and get some Middle Eastern food because I love grape leaves so I was like, I haven't had grape leaves in a long time."

Other participants discussed trying a balsamic chicken dish and visiting restaurants described in the system. In addition, two participants described how seeing CM messages inspired them to try a similar or modified version of ideas shown in CM. For example, P32 discussed how seeing a message led her to go online and find a recipe similar to what was shown in the message.

My results provide a preliminary indication that seeing messages in CM led some participants to try out new foods. However, a longitudinal study would be needed to more rigorously measure how seeing messages led to behavior change for these participants. In particular, it would be important to assess their eating habits pre- and post-intervention, comparing changes in, for example, fruit and vegetable intake and the intake of high versus low fat foods. This type of long-term study would also allow me to investigate to what extent using CM helped participants move between stages of change in the Transtheoretical Model (described in Section 6.1.2). In addition, in my future work it would be valuable to analyze the CM messages with a nutritionist to identify the nutritional value of the foods discussed and whether or not by incorporating these foods into their diet participants were taking positive steps towards behavior change.

6.3.6 Benefits of Message Sharing for the Sender

Interestingly, through my data analysis, I found that viewing messages was not the only thing that helped encourage participants towards wellness: I also found that the process of *sending* messages encouraged participants to engage in healthy eating practices. Specifically, when preparing to send messages, participants engaged in *personal behavior assessment* as they became more aware and self-critical with respect to their eating habits. Furthermore, as participants modeled positive behaviors for others (through eating healthfully and documenting these behaviors in their messages), they were themselves motivated to live up to the positive example that they were trying to set.

Personal Behavior Assessment

Earlier in this chapter, I mentioned the process through which participants, prior to sending a message, evaluated it to make sure they were getting their point across. As participants examined their messages to make sure that they were clear, appealing and useful, they spent a bit of extra time reflecting on their eating habits. Indeed, the majority of participants (n=20) said that process of having to document one's habits (for the benefit of CM viewers) meant that they became more aware of their personal eating practices. As P34 mentioned, she started to see, *"what I really eat."* P7 also described how sharing messages made her think about what she was eating more:

> "I can say honestly [using CM] has pushed me to be more conscious as to what we are eating… thinking about what I am going to eat helped determine what I would send."

This quote highlights how being a contributor in CM necessitated that the user spend time reflecting upon what they were eating. This reflection meant that the food choices they were making were on their mind more than they were previously, even if only for a brief moment. This process of consciousness-raising is similar to the growing self-awareness that individuals gain when keeping personal diet logs (*i.e.*, records of what they are eating, for example, to help them understand just how much they are actually eating). In the case of CM, the difference is that users are asked to document their behaviors not for their own personal records but in order to share their experiences for the benefit of others. Thus, CM persuades users to document their health-related behaviors using a motivator that does not just focus on the documenter; CM motivates users to record their behaviors to benefit the collective (the community). Indeed, as I described earlier in this chapter, many participants were motivated to record their behaviors to inspire others to eat better and to show them that it is possible to do so. And yet, CM users – though often motivated to share for the benefit of the collective and not themselves – also gained a personal benefit from sharing, specifically, a greater awareness of their eating habits. And, as previous research has shown, increasing awareness of one's diet-related behaviors is an important step towards improving these habits (Wing and Hill 2001). Thus, an important implication for future work is that there may be great value in designing systems that incentivize users to document their behaviors by using motivators beyond those that are focused solely on the individual.

Self-Analysis

Some participants became not only more aware of what they were eating, but also more self-critical as they actually assessed the healthiness of their behaviors. For example, P32 said that as she was preparing to share a message, she examined the foods she was eating and asked herself,

> "what is the sodium content, um, you know, how many calories am I eating."

Self-analysis occurred, in part, because participants had to evaluate their eating habits to see if they were healthy enough to share. For example, P11 said,

> "A lot of times I'm like, 'Oh, I probably couldn't send this today,' or you know, 'Could I send this today into the, you know, into the Community Mosaic?' So yeah, it makes you think about what you're eating."

Similarly, P16 assessed the foods that she was eating and actually realized that some of the foods she was sending were not very healthy:

> "I was going [to] take a picture and then I was like 'No, wait a second.' I am like, 'I don't think that's a good item,' I was like, 'That is maybe not very healthy….And I think the idea is to do healthy food'. And I was like, that does not seem very healthy.' So, I was like 'maybe I should not take a picture of that.'…And I was like, 'Maybe, if I don't want to send it, I probably shouldn't be sitting eating it or buying it in the first place if I am not going to send it.'"

As these quotes illustrate, the process of assessing their eating habits meant that many participants realized how badly they were actually eating. P3 described feeling guilty when she was not eating well:

> "If I wasn't eating the right food I felt guilty, like oh wait, 'I'm suppose to eat healthy, this ain't healthy.'… Because if I was not eating something that was maybe a lighter version or low-fat, it may have made me feel like 'Ooh, I could do better on this meal, to eat healthier.' Or if it was something fried instead of something grilled, or something fried versus something baked, it made me think about that."

Even participants who generally consider themselves to be healthy benefited from this process of self-analysis. P28 said that while she is normally health-conscious, having to decide whether or not her meal was healthy enough to send made her take a second look at her habits:

> "I think it made me realize, like if I was eating something that was not as healthy as I thought it should be I thought about it. I thought about it a little bit more than – and even though I'm normally very

conscious of what I'm eating, I would think about it and say – Hm, I don't think this is one that I would want to send."

Similarly, though P9 considers herself to be a healthy eater, preparing to send messages gave her the chance to look more closely at the foods she was eating. In doing so, she realized that she was not doing as well as she thought:

"It made me think of how badly I was eating...Like, typically I think of myself as a healthy eater but it made me realize that I was, like, on the party train and had left my good eating habits behind me….Because I realized I wasn't sending as many messages as I wanted to and I realized that it was—the reason was one, I didn't have, you know, at first I was like, I don't have time to do this, you know, to do the text…and then two, I realized the other reason was I wasn't eating things that I really wanted to take pictures of."

Assessing meals to decide if they were healthy enough to recommend to others led users to evaluate what they were eating in ways that they may not have done previously. Again, given the literature stating that reflection on one's eating habits can help people engage in positive behavior change (Wing and Hill 2001), this is an exciting finding.

Impact of Behavior Modeling for the Message Sender

In addition to helping participants reflect upon and analyze their behaviors, sharing messages actually compelled many participants (n=11) to eat more healthfully. Some felt compelled to eat better because they knew that others would be looking at their habits. For example, P4 said that using CM,

"has made me more conscientious about what I'm eating because, um, you know, I felt like there's somebody watching me or I'd have an audience and I can't talk about nutrition and health and low fat if I'm not doing it. I can't demonstrate it if I'm not doing it."

Other participants were motivated to live up to the example they were putting forth in the messages they shared. These individuals were not simply interested in inspiring others to eat well by giving them useful healthy eating ideas. Sharing messages also inspired the message senders themselves to continue engaging in healthy practices. As P10 discussed, sending messages was a reminder to participants of how they should be eating. These participants saw dissonance in sharing CM messages that encourage others to eat well and yet not "practicing what they themselves preach". For example, P6 said,

"I could not send a message with a clear conscience you know, if I had eaten a box of chocolates that day."

P11 further discussed this feeling of dissonance,

> "You're thinking about, about things that you can send in your everyday life so you try – for me I try to make better decisions. And it works….I think it helped because, you know, you're thinking about it and thinking about what you can send. I think that helped to, um, you know, you felt kind of weird to send out the messages and then you're not following it yourself."

P13 described how sending messages helped encourage her to get back into her healthy eating routine:

> "It would tell me that the things I was sending pictures of, I need to eat more of that cause like I said sometimes I fall off the boat, I might have a food attack or something, or a junk attack and, you know, the pictures would show me that I need to eat more of what I was focusing on [in the messages I sent]… It showed me that you know the pictures, the messages I was sending, I need to be eating more of that. Not just you know for the study… but I need to involve them more in my daily diet and my daily eating habits."

P33 also discussed how sharing messages led him to engage in healthier eating decisions:

> "It actually, you know, put me [in the mindset of] 'Well, okay, I need to make a better choice than, you know, stopping somewhere and getting some McDonald's or something.' Or, if I did, maybe I need to get a salad or something different. So, it - it actually kind of helped me in the sense I would make more healthier choices in eating. I actually think I might have lost a couple of pounds doing it that way too...Just a little bit, you know, nothing major....But I think it is something that I'll continue to do even after the fact like, you know, really pay attention to what I'm eating."

Thus, sharing messages had both collective and personal behavioral implications for the message senders. With a focus on the collective, participants were inspired to share their positive behaviors to encourage others that it is possible to eat healthfully and to inspire them to want to eat well. This finding is similar to previous work by Bruckman showing how a virtual audience can motivate people to create content in online contexts (Bruckman 1998). Just as Bruckman found that members of a communal online learning environment benefited personally from sharing their programming projects with others, my participants also benefited as they shared messages with others because as they were personally motivated to eat better themselves.

6.4 Summary

The results of my CM evaluation provide answers to RQ2-4. In answer to RQ2[21], my results showed that conveying taste in messages was an important part of creating engaging content. In addition, participants described the relative benefits of text and photos as mediums for experience sharing: text and photos were both functionally useful ways of conveying ideas clearly but photos had a charismatic quality to them as well. The way in which CM messages engaged participants is further contextualized by the process of message production that participants engaged in, as is evidenced by their discussion of 1) the ways in which SMS and MMS were both beneficial and challenging platforms for sharing experiences and 2) the amount of effort they put into messages in terms of forethought, photo staging and text editing.

In answer to RQ3a[22], participants' perspective on how possible it is to eat healthfully in the community was affected as they saw CM as a tool that meets specific challenges to eating well locally. In addition, CM led participants to reflect upon their own eating habits and to evaluate how healthfully they were eating. In answer to RQ3b[23], CM also helped participants gain new ideas for eating healthfully, particularly at home (though they did face some challenges in doing so) and motivated participants to eat more healthfully.

In answer to RQ4[24], post-intervention, participants were more confident that they know enough about healthy eating to give advice to others and they felt that they improve the health of their community by using CM. In addition, the interview data showed that participants felt they had important healthy eating ideas to share and that others valued those ideas. These findings suggest that participants felt capable of and successful at improving the state of health in their community. The impact that message senders had

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[21] RQ2: What factors lead people to feel engaged with commentary (thoughts, experiences, and opinions) that community members share about eating healthfully?
[22] RQ3.a: Does using these systems improve or worsen their perception of the community's ability to eat healthfully, given the environmental and cultural constraints and affordances?
[23] RQ3.b: Do they feel an increased understanding of the nutrition-related resources that exist within their community?
[24] RQ4: Do people feel that they can and are improving the state of health in their community by sharing their thoughts on nutrition?

on the community was further validated by the fact that participants indicated learning new and useful ideas by looking at CM messages, with many saying that seeing the messages motivated them to modify their eating habits.

In addition to the themes that arose in my study generally, I found there were differences in how horizontal collectivists (HCs) and horizontal individualists (HIs) reacted to and used CM. Though these differences were not statistically significant they do point to potential trends to focus on in a future longitudinal study with a larger sample size. I found that HCs shared more messages, were more enthusiastic about sharing and viewing messages in the future and felt more strongly that they help to improve the community by sharing their ideas. Thus, HCs were particularly engaged with the system with respect to *contribution*: they contributed more during the study, were more interested in contributing in the future and believed in the impact of their contributions more. These findings make sense given the value that the HC orientation places on communal responsibility, interdependence and fulfilling the needs of the larger community.

In contrast, post-intervention, HIs were more impacted around issues of *competence*: by the end of the study they more confident that they know enough about healthy eating to give advice to people in their local community and they had a greater increase in their confidence regarding YMCA members' ability to give them useful and truthful healthy eating ideas. This shift in feelings of personal competence may be related to the way in which people with an HI orientation value their individuality, individual achievements, and expressing their unique capabilities, thoughts and ideas (Nelson and Shavitt 2002). As such, it is possible that this orientation meant that reflecting on and sharing ideas in CM led HIs to improve their view of themselves as holders of useful healthy eating ideas more than it did for HCs. In addition, HIs may have started out with less interest in how others in the community can give them useful healthy eating information because they tend to value self-reliance over interdependence. However, through the course of the study, seeing the messages that others shared may have helped increase how useful they felt others' ideas can be. These findings provide initial insight into how one's position within the horizontal-vertical individualism-collectivism framework (and thus, their collectivistic versus individualistic values) may affect how

users are impacted by a collaborative health information sharing system such as CM. In my future work I hope to more systematically examine this relationship in further detail.

My results paint a rich picture of how a system such as CM can help to improve a community's capacity to eat well. The participants in my study benefited from both sending and sharing messages in a number of ways. In addition, they faced various challenges in sharing messages and obtaining useful information from the system. In the next chapter I discuss these results together with findings from the rest of my dissertation work and articulate implications for the future design of community-focused health promotion applications.

CHAPTER 7

DISCUSSION

The growing ubiquity of devices, platforms and services that allow people to monitor, store and aggregate information about their health-related behaviors means that users have access to information about themselves more than ever before. Within Human-Computer Interaction (HCI), Ubiquitous Computing (Ubicomp) and Computer-Supported Cooperative Work (CSCW) a prevalent trend has been to develop social health applications that allow people to share information about their behaviors (*e.g.,* exercise habits or how much water they drink), body functioning and medication regimen with friends, family and even strangers (Chiu et al. 2009; Hansen et al. 2008; Maitland 2006). Monitoring and documenting one's health behaviors can increase a person's self-awareness and desire to address any negative behaviors that are identified (Wing and Hill 2001). The sharing of one's health behaviors provides the opportunity for social support and influence, such that an individual can receive encouragement (*e.g.,* as someone gives a friend praise for meeting their weekly exercise goals (Consolvo 2006)), see positive behaviors modeled (*e.g.*, as a child sees a parent eating well-balanced meals (Grimes, Tan and Morris 2009)) or engage in competition that compels them to live a healthy lifestyle (*e.g.,* as they become motivated to be the person who takes the most steps in thee office (Lin 2006)).

In addition to applications that allow people to socially connect around their documented health behaviors and measures, another widespread trend has been the development of digital environments that allow people to seek advice and information about health from peers. A 2009 Pew Internet and American Life Project report found that 61% of American adults look online for health information (Fox and Jones 2009). The study also found that the majority of the information accessed is generated by lay people (as opposed to medical professionals). The canonical example of this trend in peer information exchange is the online health community, of which there are numerous for a range of health topics, from injuries to chronic disease management to more general weight loss concerns (Johnson and Ambrose 2006; Maloney-Krichmar and Preece 2005; Salem, Bogat and Reid 1997). These communities are typically made up of

geographically distributed strangers and allow members to tap into the distributed experiential knowledge base of individuals who are dealing with similar challenges. While interaction with and advice from health professionals remains an important aspect of managing one's health, an increasing number of individuals are engaging in *peer-to-peer healthcare* through applications, websites and services that are available in our increasingly networked world (Fox 2011).

While research has examined how to technologically support the sharing of health information in social contexts (*e.g,* (Chiu et al. 2009; Consolvo 2006; Grimes, Tan and Morris 2009; Lin 2006; Maitland 2006; Toscos 2008)), little is known about the design of such systems for local communities. Furthermore, while more and more people are utilizing websites and other applications to engage socially around health information, there remains a disparity in use of these tools by lower-income individuals, for example, because they often have less access to the Internet and home computers (Eng et al. 1998; Fox and Jones 2009). As such there is great opportunity – I would even argue a need – to examine how to design tools that engage these populations such that they are able to benefit from digital health information and services. In summary, the design space for future work on social applications that support health information sharing is wide open, enabled by exciting technological innovations and the benefits that social interaction around health can provide. My formative and evaluation studies provide significant insight into this design space, particularly in the context of community-based systems.

Synthesizing the results of the formative and evaluation studies described in Chapters 3-6, I present a set of topics that future work on community-based health information systems should consider. In the first four sections that follow, I reflect upon the process of designing tools that support the sharing of peer-generated health information in the community context. In particular, I discuss the sensitivity required in considering how that information is prepared, contextualized, enriched, and presented in a positive light. I then go on to describe the value of helping users engage in peer health advocacy in digital environments and the way in which one's position within the individualism-collectivism framework can shape system use. Finally, I reflect upon the way in which community-based systems can impact personal wellness.

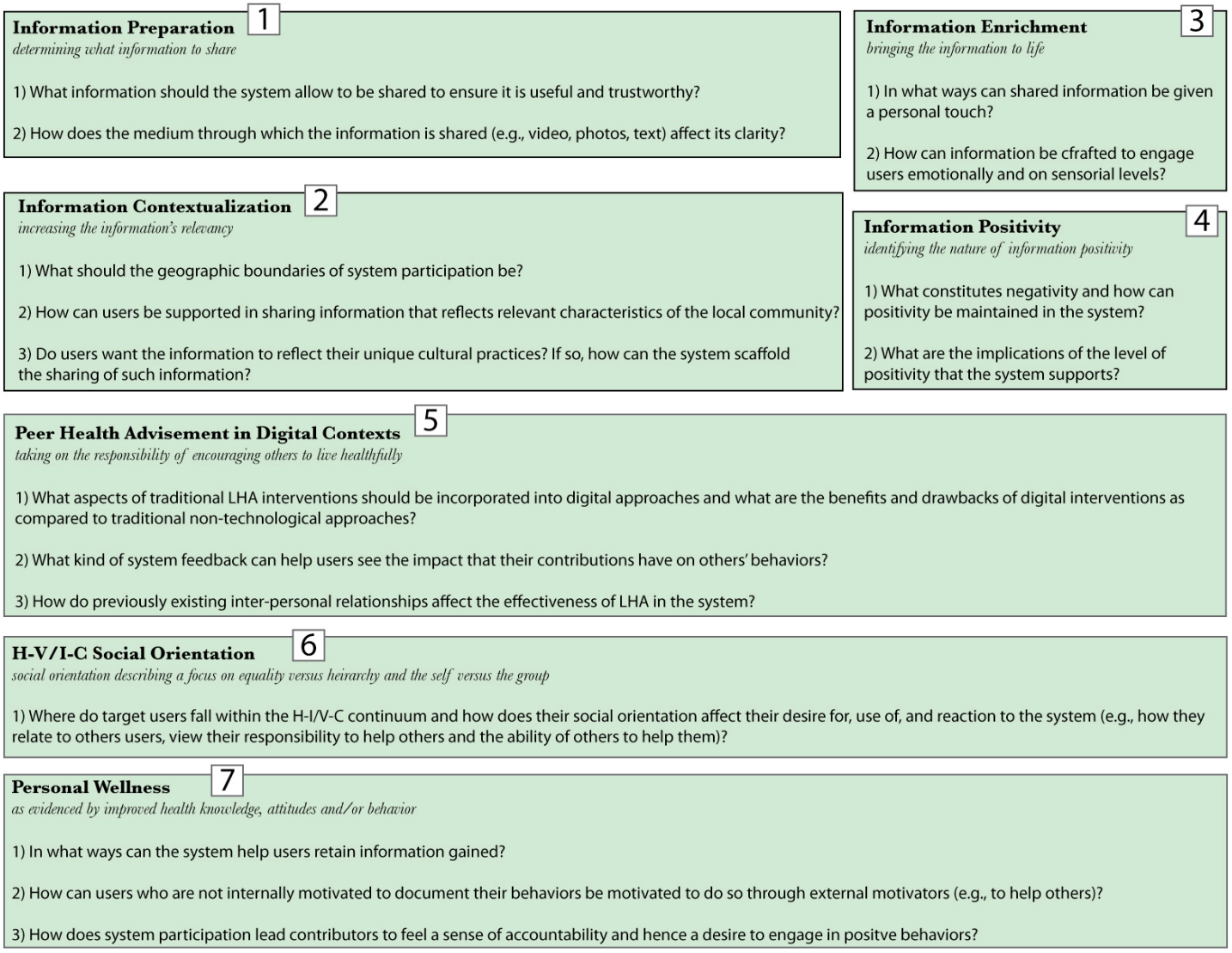

Figure 8. Summary of the discussion points presented in this chapter, including 7 considerations for the future design and evaluation of community-based health information systems.

The discussion presented in this chapter can help guide future work by giving researchers a sensitizing lens with which to start the design process and a set of questions to investigate when evaluating community-based health applications.

7.1 Information Preparation

I begin by discussing the process of preparing to share health information in a community-based system. I highlight two aspects of this process that are of particular importance: identifying what information users feel it is appropriate to share and supporting users in clearly documenting their experience and knowledge.

7.1.1 Identifying the Appropriate Information to Share

One important aspect of designing a system that supports health information sharing is identifying what type of information users feel should be shared. In the formative focus groups for the Community Mosaic (CM) system (Chapter 5), I found that participants had specific opinions about the kind of information that they would be interested in receiving from community members. They expressed a desire for information that was easy to accept in terms of its trustworthiness. This meant that they wanted relatively benign information that is grounded in personal experience such as recipes and healthy fast food recommendations. They did not, in contrast, want to receive more specific, medically based nutritional advice from their peers – such information would be harder to verify. Of course, any health information system should take great care to ensure that the ideas that are passed through it are subject to scrutiny, such that users are not exposed to medically harmful information. In my CM evaluation, I addressed this issue by moderating the system content based upon a set of criteria given to me by the YMCA. The contribution of my work is pointing out that in addition to determining what is medically appropriate to share, it is valuable to consider what information community members themselves feel that they would want to receive from other locals.

While my participants' desire for information grounded in personal experience makes sense, it may or may not generalize to other user groups. However, the implication for future work is that it is important to identify, together with potential end-users, the

types of information that they desire to receive from others in their particular community. As some communities are more tightly knit than others, for those individuals accepting more specific nutrition or medical advice from residents may feel more comfortable. Future work must tease apart community members' desires and how they are tied to existing social patterns and relationships within the community.

In addition, in the EatWell evaluation (Chapter 4), participants found it difficult to determine what kind of information other users might be interested in hearing. In CM, I addressed this concern by providing lightweight feedback mechanisms that gave contributors a sense of how well their messages were impacting others. I found that seeing how often users were inspired by their messages helped users feel that they were sending information of value. As such, future work should ensure that users are scaffolded in sharing experiences that are useful and given feedback on their contributions such that they can feel confident that they are sharing information that is valued by the community.

7.1.2 Clear Documentation of Experience

In my evaluations of EatWell and CM (Chapters 4 and 6), participants discussed the importance of conveying their point clearly and the benefits and challenges of using the mediums of voice, digital text (SMS) and digital photography (MMS) to do so. While voice provided benefits such as the conveyance of emotion (described in more detail in the Information Enrichment section below), it was also a somewhat challenging medium as most participants had to make a concerted effort to ensure that their point came across clearly. For example, some participants discussed writing their thoughts down before recording a memory or having to re-record their messages. SMS text (particularly as compared to digital photos) was a beneficial way of sharing information that was detailed enough for viewers to practically use the idea shared (*e.g.,* by including a dish's ingredients or how it was prepared). At the same time, texting presented challenges, as some participants did not have good texting skills, which made the process of creating a text a laborious one. Even some participants who were comfortable with texting discussed sending shorter text messages or no text at all because they did not want to take

the time, or did not have the time to craft a message. Thus, these individuals may have omitted useful information because of the time, effort or skill involved in writing a text.

Participants found photos useful for clearly conveying their ideas because they could visually show others the foods that they had eaten so that, for example, the viewer could know what to look for when they visit the store. Some users described staging the food before photographing it to ensure that they made the right impression on viewers. At the same time, some participants complained that the poor quality of their phone made it difficult for them to generate a clear photograph of their meals and others discussed the temporal challenge of remembering to photograph their meal before eating it.

These results show that my participants found it important to ensure that they clearly documented their experiences and each medium had strengths and weaknesses in terms of facilitating this. Future work should examine the relative benefits and constraints that different media affords, in terms of helping users to convey their points clearly. For example, research could examine the benefits of helping users share short video demonstrations of how they prepare healthy meals at home. Terrenghi *et al.* designed the *Living Cookbook* application, which allows users to create such recordings to share with loved ones (Terrenghi, Hilliges and Butz 2007). A similar application could be designed for the community context. Researchers should examine to what extent video recording and other forms of media help users to convey the aspects of their behaviors that they feel are most important for helping others in the community to live healthfully.

7.2 Information Contextualization

My research has shown the value of locally contextualized health information as well as the complexity of appropriately contextualizing this information culturally. First, most EatWell clips (excluding those related to cooking at home) described specific local food establishments, thereby helping users to gain ideas for where they can go to eat well in Atlanta neighborhoods. Participants in the CM formative focus groups further described the value of making community members more aware of healthy eating options at local restaurants and nutritious, yet inexpensive options at local supermarkets (Chapter 5). In my evaluation of CM, I found that participants felt that in allowing people to share practical healthy eating ideas, CM specifically met important community needs by

showing the importance of eating well and giving users numerous healthy meal options in the face of the abundant unhealthy food sources that currently exist in the community.

These findings show how a system that is constrained and focused on individuals within the same general geographic area can support the sharing of information that is relevant given the barriers to, and resources for eating well locally. Future work should look at other ways of providing locally relevant ideas and resources for healthy living that take into account the context of the particular community being shared. In my work, I focused on Southwest Atlanta, GA, an area in which residents are faced with the challenge of low-quality grocery stores, the prevalence of fast food options and understanding how to make healthier selections at local soul food and Caribbean food establishments. As future work pursues the design of community-based health applications, it will be important to identify the particular nuances and characteristics of the community being served.

Furthermore, research must carefully consider how *deeply local* (Chapter 4) to make the system, that is, how much to geographically constrain the user population. For example, while in my CM evaluation I limited participants to those who lived in, worked in or frequented the area around a YMCA branch, participation could have been further limited (*e.g.,* by only including individuals living in the same zip code as that of the YMCA branch) or further expanded (*e.g.,* by including anyone living in Atlanta). The way in which the geographic boundaries for system participation are placed may have important implications for the relevance and usefulness of the shared experiences (Grimes 2010). If a system includes users from too broad a geographic area, some of the benefits of supporting social interaction amongst people within the same neighborhood context (*e.g.,* the empowerment of lay health advocates as described later in this chapter) may be lost. Alternatively, limiting participation too narrowly may affect a system's ability to positively impact a large group of users and may limit the diversity of content that is shared. System designers must carefully weigh the tradeoffs involved when deciding how *local* is defined.

In addition to local contextualization, my research highlights the complexity of trying to account for the influence of users' cultural background on their health-related values. In the formative focus groups for the CM study, participants were most excited

about promoting healthy eating by sharing ideas for how to prepare cultural dishes (*e.g.,* soul food) in a healthy way. However, I found that very few CM messages described cultural foods or cultural eating establishments. This finding is echoed in the EatWell evaluation results: very few memories in that system described cultural foods. Thus, there appears to be a mismatch between what people desired to receive information about and what kind of information was actually shared. It is unclear if this pattern of contribution was due to individuals rarely eating such foods, not feeling comfortable speaking about them or not knowing how to create healthy versions of traditional dishes. In my future work, I hope to further examine the apparent discrepancy in the value that is placed on culture in health contexts (both as articulated by previous research and participants) and the simultaneous absence of explicit references to it in the use of systems like CM. It may be the case that while culture is valued and shapes who we are and how we act, it is not something that people desire or think to reflect upon in the everyday use of a system such as CM. One important step in my future work would be to directly ask participants to discuss how frequently they actually eat cultural foods themselves. While there may be a perception that such foods are widely consumed, it may be that in practice, they are not eaten on a regular basis. More broadly, future work on community-based information sharing applications should 1) examine the extent to which users desire to learn how to manage their health in a way that reflects their cultural practices (*e.g.,* alternative medicine practices) and 2) scaffold users in providing culturally-contextualized information only to the degree that they are interested in doing so.

7.3 Information Enrichment

In addition to contextualizing information, my formative and evaluation studies show the value of enriching shared health information by giving it a personal touch and by accounting for the importance of affect and sensory experience. First, EatWell messages were beneficial in part because they contained strategies that were tried and tested by the message sender as opposed to just being impersonal recommendations for healthy eating. The messages often contained intimate glimpses into the storytellers' lives and allowed their personality to come through as they described their experiences. Participants in the CM formative focus groups discussed the value of personal ideas as

well: as users discussed in my evaluation of EatWell, these participants wanted to hear personally tested healthy eating ideas and how the person has been personally affected by their eating habits, not simply general advice for eating well. Indeed, I found that the vast majority of messages shared in CM clearly included healthy eating ideas that the message sender had tried out personally.

In addition to personalization, CM and EatWell users transformed the content they shared from dull recommendations to engaging commentary by tapping into the value of affect and sensory experience in their discussions of how they have tried to eat nutritious foods. In EatWell, part of what made participants interested in the memories was being able to hear the emotion in the message creator's voice as they described their experiences. For example, users were able to hear the joy, excitement and pride that message contributors felt because they were successfully eating well. In addition, my evaluation of CM showed how users did not simply want to convey factual data about their eating habits (*e.g.,* the list of ingredients in a meal) – they also valued sharing and seeing sensorial aspects of the foods. In particular, participants described the importance of conveying taste in messages and sharing photos that were aesthetically pleasing and which vividly showcase the colors of a dish.

My research shows that while health information sharing applications must of course focus on helping individuals share content related to wellness, the information should not just connect with individuals intellectually, but on emotional and sensorial levels as well. Various researchers have argued for a deeper understanding and appreciation of the way in which we *experience* technology as opposed to simply how we *use* it. As McCarthy and Wright point out, "interacting with technology involves us emotionally, intellectually, and sensually" (McCarthy and Wright 2007). Attempting to convey emotion in digital environments is actually something that many people do already – the question becomes, however, how well is the technology supporting this transfer? For example, research has documented the effort teens put into expressing themselves in their text messages and the emotional connection that they have to the messages they keep stored in their inboxes (McCarthy and Wright 2007; Taylor and Harper 2002). Boehner *et al.* have further articulated how designing applications that invoke and convey the richness and emotion of lived experiences can provide a

heightened sense of engagement (Boehner, Sengers and Warner 2008). In the same vein, I argue that when designing health applications (technologies that are susceptible to rational reductionism) it is valuable to similarly help users convey the emotional and sensorial aspects of their experiences in ways that the people accessing that content can appreciate. By moving beyond the transmission of health-related *data* to the sharing of rich *experiences*, systems can help to engage users and potentially increase their desire to view content. Future systems should support the sharing of rich information in the ways described here and research should also examine other methods of enrichment.

7.4 System Positivity

Future work should also examine the importance of system positivity. In the formative CM focus groups, I found that people were quite adamant that a future system should not facilitate the discussion of the challenges that the community faces but rather focus on making individuals' healthy eating successes visible. Accordingly, the CM Visualization prompt encouraged users to share how they were able to eat well and almost no messages described challenges that users faced. Similarly, the vast majority of memories in EatWell were positive in nature. In my evaluation of CM, I found that some participants were so concerned with CM remaining a source of positivity that they disliked the idea of allowing users to share more detailed reactions to messages in the future. Participants felt that this functionality might lead to the sharing of negative comments and were concerned with CM remaining a positive information sharing space.

The implication of these findings is that in future work, it is valuable to examine how critical community residents feel it is to maintain positivity in the system being designed. It appears that the participants I worked with were concerned with CM being positive, in part because there is already a lot of negative media around the disproportionate health challenges in the African American population and in low-income communities. Other communities that do not experience such negative discourse may not be as sensitive to this issue. Another important direction for future work is examining the implications of a system that is so positive in nature. What are the drawbacks of such a system and in what ways might limiting criticism keep users from getting information that is sufficiently vetted in terms of its validity?

7.5 Peer Health Advisement in Digital Contexts

In the traditional sense, *lay health advocates (LHAs)* are individuals who are trained and supported in being voices for change, individuals who try to rally their community towards healthier living. LHAs are typically taught about health and wellness and given financial and/or organizational support to encourage community members to live healthfully. This encouragement may entail teaching others health management skills, pointing them towards community health resources and services or speaking words of encouragement to help motivate them towards healthier living. My research was informed by this approach, as it resonates well with my goal of designing interventions that incorporate collectivistic values such as communal responsibility and interdependence.

I found that taking an LHA-inspired approach was beneficial in both my evaluations of EatWell and CM. First, users were excited to see people in the community acting as LHAs, that is, individuals concerned with advocating healthy eating practices. Participants in the EatWell evaluation study were encouraged by the sense of collective effort that they felt when seeing others be concerned enough about the health of the community to take time to share their healthy eating ideas. In both the EatWell and CM evaluations, participants were excited to have a platform through which they could advocate healthy eating, a platform through which their voice could be heard. Second, accessing the healthy eating ideas and recommendations of their fellow community health advocates personally impacted users. For example, EatWell users felt a sense of hope at seeing that there were others like them who were successfully eating well. Third, through their use of CM, the importance of participants' role as a health advocate was reinforced. Users received validation that their ideas were valued and that they were having an impact by seeing viewers' reactions to their messages (*e.g.,* by seeing how frequently the "inspired" Community Response Panel button was pressed for content they shared). Indeed, participants believed that they help to improve the health of their community by sharing content in CM. At the same time, participants did feel unsure of the impact that their messages had, since they felt that their effectiveness ultimately depended on how viewers received their ideas and to what extent seeing those ideas affected their behavior. This suggests that future work should examine how to give

system contributors more detailed feedback regarding to what extent the content they share impacts behavior change for the viewer.

While the LHA model informed my work, my research also differs from it in that traditional interventions typically provide extensive training programs for the LHAs (*e.g.,* on health topics) and information is often delivered to community members in structured settings such as workshops or health events. While such interventions have been successful, future work should continue to examine the impact and effectiveness of digital interventions such as the one that I took in my research. For example, while LHAs typically have extensive training, EatWell and CM users did not receive such instruction. In my future work, I plan to examine the quality of messages shared by conducting a more extensive content analysis of the messages with a nutritionist. Through this analysis I will examine the nutritional value of the ideas shared in CM. Doing so will help me to see to what extent users, without training, were able to share ideas that are nutritionally sound.

Supporting peer health advocacy in a digital environment has at least two potential benefits as compared to traditional LHA interventions: it is potentially more scalable since the effort required to help people advocate healthy living is minimal and the number of people who are sharing healthy living ideas is maximized. Future work should examine more deeply the affordances of digital and traditional approaches and even how the two might be combined to have greater impact. For example, providing health education to key community members would be one way to train individuals capable of moderating the information that is shared in a community-based health information sharing system.

In traditional interventions, the LHA often already knows the community members that they educate (Auger and Verbiest 2007). In contrast, in both EatWell and CM many users did not know one another at all and the information was shared anonymously. This lack of personal familiarity may have affected how the information was received. Future work should examine the impact of existing interpersonal relationships on community-based health applications that facilitate peer health advocacy. More broadly, future work should more systematically compare the benefits and

drawbacks of tools that provide technological support for peer health advisement to traditional instantiations of the LHA model.

7.6 HV/IC Social Orientation

Collectivism was a driving concept in my dissertation research. Motivated by research showing the prevalence of a group-focused mindset in the African American population and the way in which this orientation affects health attitudes, I designed two community-based systems (Coon and Kemmelmeier 2001; Kim and McKenry 1998; Kreuter et al. 2003; Phinney 1996). And yet, while the culture itself is often characterized as collectivistic, it was important to examine just how my participants were located on the individualism-collectivism continuum. Furthermore, I examined not simply their orientation as individualistic or collectivistic, but also where they stood along the horizontal-vertical dimension, which specifies to what extent a person values and accepts equality versus hierarchical relationships within the group. Surprisingly, I found that while African Americans are often characterized as collectivistic, the majority of my participants were horizontal individualists (HI). Of the remaining participants, most were horizontal collectivists (HC). Only one person was a vertical individualist (VI) and no one was vertical collectivist (VC).

The way in which my participants were positioned in the Horizontal-Vertical/ Individualism-Collectivism (HV/IC) Framework is intriguing for four reasons. First, researchers have characterized American culture as VI because of its tendency to value autonomy, independence, competition, and attempting to be the "best". Yet, I found that only one person in my study was VI. This finding provides an initial indication that there is value in understanding users' specific social perspectives and not simply accepting broad cultural generalizations, particularly when looking at ethnically diverse nations such as the United States.

Second, my participants were much more individualistic than collectivist. There are a number of potential explanations for this finding, though further study is needed to better understand exactly why my participants were mostly individualistic when much previous research has characterized the African American culture as collectivistic. One explanation is that the survey I used to measure participants' position within the

individualism-collectivism framework was ineffective. As I will discuss in Chapter 8, using a survey alone may not be the most useful way of studying cultural values. Another explanation is that, as I discussed in Chapter 2, though the African American culture has traditionally been described as collectivistic, various social science researchers have argued that previous work has underestimated the value of individualism in this population. For example, some researchers argue that the African American culture can be characterized as valuing *expressive individualism* whereby people attempt to breakaway from the monolithic cultural label of being "Black" by showing their uniqueness through various means, for example, showcasing their personal sense of style (Jones 1997; Komarraju and Cokley 2008). Indeed, the expressions of individualism within this culture may very well exist, just in ways that are different from what researchers have traditionally looked for when studying individualism and collectivism. Yet, many previous health interventions have been motivated by an assumption of collectivistic values within the African American culture. My research suggests the importance of specifically measuring where target users fall within the HV/IC Framework and not assuming that they will possess any particular cultural value.

Thirdly, examining participants' position within the HV/IC Framework was useful because I found that HIs and HCs differed in their use of and reaction to CM (*e.g.*, HCs contributed more and were more excited about contributing in the future), though these differences were somewhat small and not statistically significant. The small difference in the way that HCs and HIs used CM could suggest that users' individualistic or collectivistic outlook will not significantly affect their use of a system such as CM. Still, as some differences did emerge in participants' use of the system, further examination of these trends in longitudinal studies with a larger sample size is warranted. More broadly, future work should systematically examine to what extent, when designing health applications for any cultural group, users' collectivistic versus individualistic viewpoints affect system interaction and the impact of the system (whether studying a nationally-defined group such as the *American culture* or an ethnically defined group such as the *Latino culture*). As more HCI researchers examine this relationship, we can begin to build up a theoretical framework detailing the relationship between social orientation and the way that people use and are impacted by social health applications

(and conceivably, collaborative technologies more generally). Such a framework could help researchers identify starting points for design and research questions to investigate in their system evaluations. In the context of community-based health applications, the HV/IC framework provides researchers with a number of aspects of users' social perspective to examine, particularly with respect to how people relate to others, view their responsibility to help others and the ability of others to help them.

A final point to consider is how prevalent the horizontal perspective was amongst my participants. Only one person was VI and no one was completely VC (one person scored equally high on HC and VC). This indicates that participants were united in seeing other group members as equal in status to them, as opposed to valuing hierarchical relationships. People with a horizontal orientation also tend to discourage competition and attempts to be better than others. Even HIs, who value their uniqueness, tend to do so without comparing themselves to others (thus maintaining an equal status with other group members). In contrast, VIs may focus more on the relative superiority of group members (*e.g.,* in terms of intellect, social status or class). The fact that almost all participants were horizontal may explain why they generally accepted and enjoyed CM, a system that placed all users on an even playing field. That is, anyone could share their ideas, regardless of their social status, experience with health or educational level. While participants in my CM formative focus groups did indicate a preference for getting experiential knowledge from community members as opposed to more specific medical knowledge, they saw value in the ideas peers might have regarding topics such as healthy recipes and fast food recommendations. And, in my evaluation of CM, participants indicated that they saw value in CM messages and were enthusiastic about viewing them in the future. Their horizontal values may have made them more accepting of receiving these ideas from peers, individuals who are not necessarily trained health experts. An interesting direction for future work would be to examine the extent to which horizontal and vertical orientations affect people's willingness and desire to accept the health and wellness ideas from peers versus medical experts.

7.7 Personal Wellness

Community-based health information sharing systems have the potential to help people move towards improved wellness by increasing health knowledge, encouraging self-awareness and ultimately inciting behavior change in new and exciting ways. Indeed, in my CM formative focus groups, I found that participants desired not to simply speak about healthy eating, but to have a system that motivated people towards action and behavior change. In my evaluation of the CM system I found that it helped users gain healthy eating ideas from others and that some people actually tried out the ideas they saw in the system. However, while many individuals felt that CM messages contained useful information, they often had trouble recalling exactly what they saw. This finding suggests that future work should examine how to better support individuals in retaining the information that they gather in health information sharing systems. For example, future applications that allow users to save ideas they find particularly interesting and that subtly remind users of these ideas throughout the week could be quite useful. An extension to CM would be to allow users to choose messages that they like and have them sent to their phone. An application on the phone could then display an ambient reminder in the background of the user's cell phone display to subtly remind users to try out the ideas.

Beyond viewing others' ideas, documenting and sharing their behaviors helped message senders become more aware of how they were eating and to critically assess the healthiness of their behaviors. Previous work has similarly shown that keeping a fitness log helps people reach their wellness goals because they gain an increased awareness of their behaviors and begin to more critically assess them (Wing and Hill 2001). The benefit of personal logging has motivated a number of HCI and Ubicomp applications that support users in both manually and automatically keeping digital records of their diet and exercise (*e.g.,* (Consolvo et al. 2008b)). CM is interesting and distinct from this previous work however, because it motivates and implores users to document their behaviors not for their own sake, but for the benefit of others in their community. And yet, I found that users still received similar benefits to individually focused monitoring applications as well as social monitoring applications that tend to incentivize documentation through competitive mechanisms. Instead, CM motivates users to record

their behaviors using a cooperative and externally focused incentive, but still affords the same personal benefits of self-awareness and analysis. This finding suggests that future work should further explore such external mechanisms for compelling users to monitor their behaviors and the extent to which individuals who were not otherwise interested in such monitoring are persuaded to do so.

Finally, I also found that participants in my CM evaluation were motivated to eat healthfully because they wanted to live up to the example that they set in the messages they shared. Thus, sharing their behaviors gave them a sense of accountability. Future work should examine the extent to which such impact is sustained over time.

7.8 Illustration

In Figure 8, I list some important questions to ask within each of these areas of focus. While these questions do not represent an exhaustive list, they will provide a starting point for the design of future community-based health information sharing systems. Furthermore, the directions that I suggest are particularly relevant to the increasing work within HCI focused on developing tools that leveraging the "local". While some researchers have voiced concern that technology detracts from social engagement, other work has discussed the potential for it to engender a revitalization of local community interaction (Taylor and Cheverst 2010). A number of projects have examined the role that public displays (in locations such as community centers and coffee shops), mobile phone applications and websites can have in serving local communities (Carroll and Rosson 1996; Churchill, Nelson and Hsieh 2006; Taylor et al. 2007). These projects have sought to increase participation in community events, help users feel more connected to the community, increase access to community-relevant information and facilitate civic engagement (Brunette et al. 2005; Carroll and Rosson 1996; Foth, Gonzalez and Kraemer 2008). In sum, these place-based community projects seek to leverage the shared context and proximity of individuals in local neighborhoods in a way that positively benefits residents (Foth, Gonzalez and Kraemer 2008). Thus, within HCI, there is clearly a growing interest in designing systems that reflect and build upon the nuances of the relationships between people who live in and frequent the same geographic areas.

Yet even given the range of previous work done in this space, researchers have rarely focused on using ICTs to address local health issues by rallying communities to promote wellness amongst residents. Given the increase in tools and services for capturing, storing and making available location-based data commercially (*e.g.,* GPS receivers and APIs such as Google Places) and in research settings (Büttner et al. 2010; Hutter et al. 2008), the infrastructure clearly exists to facilitate such applications. Furthermore, location-based collaborative applications have gained growing popularity in the general public, as evidenced by the many locally focused social media applications (*e.g.,* Foursquare and Gowalla[25]) and neighborhood focused online communities (*e.g.,* the Neighbors for Neighbors[26] project in Boston). As such, the recommendations for future work that I have presented in this chapter contribute significantly to previous research by providing a starting point for designing health applications for place-based groups.

I now provide an example of how the design considerations described in the first seven sections can help guide the development of a new system. Consider a project in which the research team is interested in encouraging increased physical activity within an apartment complex. I will now walk through each of my seven discussion points to construct a hypothetical design concept.

(1) Peer Health Advisement in Digital Contexts: *What aspects of traditional LHA interventions should be incorporated into digital approaches?* It is first for the research team to consider how they want to encourage residents to take on the responsibility of encouraging others in the community to be physically active. The traditional LHA model contains the following components:

1. *LHA Identification:* The research team typically appoints people who are currently trusted within the community to be LHAs.
2. *LHA Training:* LHAs are given skills and motivation to deliver trustworthy health information and to develop their sense of self-efficacy in counseling others (Wilson et al. 2008). For example, they may be educated on health topics or

[25] https://foursquare.com/, http://gowalla.com/
[26] http://neighborsforneighbors.org

theory-based methods of encouraging behavior change (*e.g.*, crafting one's messages based upon the person's readiness to make a change).

3. *Method of LHA Health Promotion:* The LHA's main responsibilities are typically to provide other community members with health-related education, advice, emotional support or referrals to local services. They may also advocate the needs of the community to local leaders and institutions and help bridge the community to the health care establishment (*e.g.,* by carrying out services or duties traditionally done by healthcare professionals such as breast cancer screenings) (Eng, Parker and Harlan 1997; Russell et al. 2010)

The research team must decide which aspects of the traditional LHA model to implement and which to adjust for the purposes of their digital approach.

First, the research team should decide who is allowed to play the role of an LHA in the system (*LHA Identification)*. For example, they could appoint specific residents to share exercise information instead of allowing all to do so, as I did with the EatWell and Community Mosaic systems. One approach would be to identify individuals who are currently well liked in the community and who are perceived to be athletic and health conscious and appoint them to be peer health advisors, that is, individuals with the ability to provide fitness suggestions in the system. The research team might decide not to provide formal training in order to reduce the barriers to system participation (*LHA Training)*. The LHAs' responsibilities could be focused on educating community members about the benefits of different types of physical activity and pointing them towards local fitness resources (*Method of LHA Health Promotion*). Other residents could then be able to access the system content and share their experiences describing how they have incorporated the recommendations into their lifestyle. When they begin increasing their activity levels, the system could promote these residents to LHA status and subsequently give them the ability to contribute their own recommendations in the system. Of course, system users' **HV/IC Orientation (2)** will affect how they react to this type of hierarchical arrangement of system users. The research team would need to study where users fall within the HV/IC framework and how this affects their use of and reaction to the system.

(3) Information Preparation: *What information should be shared?* While the LHA model highlights various types of information that the health advocates can share, this does not mean that community members will actually be receptive to this information. The research team would need to conduct a formative study to understand what community members would consider useful and trustworthy information to obtain from their peers, particularly those who are seen as currently engaging in a physically active lifestyle (as specified in Step 1 above). In addition, the research team must decide what type of media would best allow system users to share their experiences and recommendations.

(4) Information Contextualization: *Increasing the information's relevancy.* By focusing the system on people who live within the same apartment complex, the research team enables information sharing amongst individuals with a common frame of reference. These individuals should have access to similar athletic clubs, hiking trails, biking routes, and other such resources in their area. Residents will likely face similar affordances and drawbacks that their neighborhood may have with regard to exercising. For example, the apartment complex might have a great exercise room available to residents, but it might not be situated in an area with good outdoor running routes. Given this shared context, LHAs will be well suited to help point out ways of leveraging the local resources and getting around the barriers to exercise.

(5) Information Enrichment: *How can the system help users bring the information to life?* By encouraging LHAs to advocate physical fitness based upon their personal experience, the system can help support the sharing of information that has a personal touch. In addition, providing mechanisms that allow users to augment their digital recommendations in fun and creative ways can further support users in allowing their personality to shine through. The system could also encourage users to not only recommend local options for physical activity such as hiking, but to describe the way that such exercise affected how they felt. For example, if an LHA described the way a hike calms her mind, relaxes her body and makes her feel more balanced her recommendation to try out a local hiking trail might be more engaging to users.

(6) System Positivity: *What should the nature of information positivity be in the system?* The research team must identify what the community considers to be negative

versus positive information and experience sharing. For example, to what extent would constructive criticism be seen as an expression of negativity? Would speaking about the challenges in the neighborhood as a way of identifying ways to overcome those challenges be considered negative or positive? The research team must subsequently design the system in a way that produces an overall positive tone but that still allows information to be properly vetted.

(7) Personal Wellness: *How does the system affect users' health knowledge, attitudes and/or behavior?* As the research team works out the design details, they must carefully consider how the system will encourage users towards increased wellness. In particular, how will shared information help to improve users' understanding of their local exercising options and how will that improved understanding ultimately lead to a shift in health attitudes (*e.g.,* regarding their ability to exercise regularly) and behaviors (*e.g.,* the adoption of a regular exercise routine). The viewer's **HV/IC Orientation** may mediate how accepting residents are of the information viewed in the system. If the viewer is a vertical collectivist (VC), for example, he may be particularly accepting since the system reflects a sense of hierarchy (in terms of who is able to recommend ideas) as well as a sense of interdependence (as residents rely upon one another for informational support). However, if he is a vertical individualist (VI), he may be a bit more reluctant to rely upon others in the community for valuable information. The research team would need to further examine such differences in a rigorous field evaluation of the system.

In addition, the research team should examine to what extent sharing information impacts the information sharers' (the LHAs) wellness. For example, does having the responsibility of alerting community members to local resources lead the LHAs to become more knowledgeable about how they can personally keep an active lifestyle? Finally, the research team should examine to what extent, over time, increased wellness on the part of the LHA reinforces their role as a health advocate, for example, by increasing their interest in and self-efficacy regarding advising others. Furthermore, the researchers should study to what extent the LHA's **HV/IC Orientation** mediates this relationship between increased personal wellness and LHA capacity.

7.9 Summary

While numerous researchers have examined the impact of sharing information about one's health-related behaviors and opinions with friends, coworkers or geographically distributed strangers, there has been very little work examining the impact of sharing in the local community context. Furthermore, while community and location-based services are becoming more widespread, few applications have focused on improving health. While they do not represent an exhaustive list, the discussion points that I have presented in this chapter have implications for both the design and evaluation of future community-based health information sharing applications.

CHAPTER 8

CONCLUSION & FUTURE WORK

In this dissertation, I have detailed the work that I have done to answer my overarching research question: *How can the cultural construct of collectivism be incorporated into the design of nutrition-focused technologies for low-income African American communities, and what are the implications of doing so?* My work included two sets of formative studies (Chapters 3 and 5) in which I used focus groups, participatory design sessions and surveys to obtain a set of design guidelines. I used these guidelines to design and implement two novel community-based health applications, EatWell and Community Mosaic (CM) (Chapters 4 and 5). I evaluated both systems through in-depth field deployments, using a variety of methods (including interviews, content analyses of system content, focus groups, system log analyses and surveys) to triangulate participants' responses and arrive at an in-depth understanding of how they used and were impacted by my systems (Chapters 4 and 6). Finally, I synthesized all of my findings to articulate a set of important considerations as future research approaches the design and evaluation of community-based health information sharing applications (Chapter 7).

In the next section, I briefly review the answers that my dissertation research has provided to my four research questions. I then conclude by stepping back and reflecting more deeply on two higher-level themes that my dissertation research speaks to and the implications that each theme has for future work. First, I reflect upon the value of examining how culture shapes health behaviors and attitudes in HCI technology design. Second, I argue for the importance of a research agenda focused on designing technology that addresses health disparities within developed nations.

8.1 Summary of Research Question Answers

RQ1: With what aspects of nutrition are individuals in low-income African American communities most interested in receiving support and what socio-cultural considerations should be made when providing this type of support?

In my first formative study (Chapter 3), I found that participants were most interested in receiving technological support for learning new healthy eating strategies. Furthermore, this study highlighted three important socio-cultural considerations that guided my subsequent research:

1. Users may face serious economic and environmental challenges to eating well (*e.g.,* affording and locating healthy foods in their neighborhoods).
2. Allowing users to share their healthy eating experiences with others in their socio-cultural context can be beneficial because they may have a shared sense of common ground (with respect to identifying similar cooking and eating interests and experiences) and can learn from the experiences of their peers.
3. When addressing the health issues of a particular cultural group it is important not to overemphasize how they are different from other groups. In particular when addressing groups with health disparities, overemphasizing their differences may lead that group to feel negatively singled out.

The results of my formative CM focus groups with YMCA members and staff (Chapter 5) provided deeper insight into the first part of this question. Participants in this study were most enthusiastic about receiving the following kinds of information about healthy eating from other community members:

1. healthier cultural recipes,
2. resources for healthy eating that reflect the area in which they live as well as their busy lifestyles and
3. information that helps motivate and provide actionable ways for people to engage in health behavior change.

RQ2: What factors lead people to feel engaged with commentary (thoughts, experiences, and opinions) that community members share about eating healthfully?

There are three main reasons for which participants felt engaged with the content in EatWell (*i.e.,* why they were interested in listening to the shared memories):

1. First, the EatWell clips described personal experiences rather than just focusing on generic healthy eating guidelines.
2. Second, the memories expressed the emotion and personality of the storytellers.
3. Third, some participants felt a sense of identification with other EatWell users.

The results of my formative Community Mosaic focus groups (Chapter 5) also helped to answer RQ2 by highlighting the characteristics of the community-shared health information participants said that they would value. Participants felt that when sharing information about healthy eating, the content should be:

1. easy to accept in terms of its trustworthiness (*e.g*, recipes as opposed to medical advice),
2. personalized such that it is grounded in individuals' experiential knowledge (as opposed to more generalized healthy eating recommendations) and
3. focused on how community members have successfully eaten well as opposed to focusing on the barriers to healthy eating that exist in the community.

Finally, in my evaluation of CM (Chapter 6) participants discussed trying to produce messages of value and what they valued about the messages that they viewed:

1. My results showed that conveying taste and innovation (*i.e.*, not sharing obvious ideas) in messages was an important part of making the content engaging.
2. In addition, participants described the relative benefits of text and photos as mediums for experience sharing: text and photos were both functionally useful ways of conveying ideas clearly but photos had a charismatic quality to them as well.

The way in which CM messages engaged participants is further contextualized by the process of message production that participants went through, as is evidenced by their discussion of 1) the ways in which SMS and MMS were both beneficial and challenging platforms for sharing experiences and 2) the amount of effort they put into messages in terms of forethought, photo staging and text editing.

RQ3: In what ways does accessing the nutrition-related commentary of local community members affect how people conceive of the state of health in their community? RQ3.a: Does using these systems improve or worsen their perception of

the community's ability to eat healthfully, given the environmental and cultural constraints and affordances? RQ3.b: Do they feel an increased understanding of the nutrition-related issues and resources that exist within their community?

The results from the Community Mosaic evaluation provide answers to these questions. In answer to RQ3a, I found that participants' perspective on how possible it is to eat well locally was affected because they saw CM as a tool that addressed specific challenges to eating well within the community. For example, they said that in the face of the advertisement of and access to unhealthy food in the community, CM helped remind the community of the importance of healthy eating and that CM was a source of healthy local options. In this way, people began to have a new perspective on the way that a piece of technology can help impact the community's ability to eat healthfully. CM also led participants to reflect upon their own eating habits and to evaluate the healthiness of their dietary choices.

In answer to RQ3b, participants indicated that CM helped them gain new ideas for eating healthfully. However, they did describe challenges to gaining useful ideas from CM as a result of limited interaction with the Display and having trouble recalling the details of the messages that they saw.

RQ4: Do people feel that they can and are improving the state of health in their community by sharing their thoughts on nutrition?

In my evaluation of EatWell, participants were excited to see that others were working to collectively improve the health of the community. However, I did not gain insight into how much people felt that they were *personally* helping to improve the health of their community by sharing their experiences. In the Community Mosaic study I directly answered RQ4 by looking more deeply at what people feel their personal role is in affecting the health of the community. I found that post-intervention, participants were more confident that they know enough about healthy eating to give advice to others and they felt that they improve the health of their community by sharing their ideas in CM. In addition, the interview data highlighted how participants felt that they had important healthy eating ideas to share and that others valued those ideas. These findings suggest that participants felt capable of and successful at improving the state of health in their community. The impact that message senders had on the community was further

validated by the fact that participants indicated learning new and useful ideas by looking at CM messages, with many saying that seeing the messages motivated them to modify their eating habits.

8.2 Examining Culture in Health Technology Design & Evaluation

I now shift gears to discuss some of the broader themes and HCI research agendas that my dissertation work speaks to. Various HCI researchers have looked at the relationship between culture and technology, particularly in cross-cultural studies comparing how individuals in different countries use Information and Communication Technologies (ICTs) (Kayan, Fussell and Setlock 2006; Lewis, Ellis and Kellogg 2010; Setlock and Fussell 2010; Vatrapu 2010). Research on developing countries has also explored the range of cultural considerations that arise as researchers venture into new design settings (*e.g.,* researchers have encountered differing values of social responsibility, expressions of power dynamics and even design aesthetics) (Brewer et al. 2006; Irani et al. 2010; Ramachandran et al. 2010). However, there have been two important omissions within the body of HCI research on culture. First, much of the work has focused on the way a country's macro-culture shapes technology use but few researchers have looked at the subcultures that exist within the countries studied (Irani et al. 2010; Recabarren, Nussbaum and Leiva 2008). Second, within the context of health, few HCI researchers – particularly those focused on health in the developed world – have examined the role that culture plays (various projects in the developing world are notable exceptions, *e.g.* see (Ramachandran et al. 2010)).

These two omissions in previous work – unpacking the relationship between culture and health and examining the varied experiences and perspectives of ethnic subcultures – must be addressed in future work if we are to realize a comprehensive HCI heath technology research agenda. Health researchers have long argued that culture shapes health behaviors and attitudes and that understanding this relationship is critical to developing effective interventions for a diverse group of people (Campbell 1999; Karanja 2002; Kreuter et al. 2003). This is because a person's cultural background shapes (both directly and indirectly) health behaviors, health outcomes and perceptions of medical care and professionals (James 2004; Kreuter and McClure 2004; LaVeist, Nickerson and

Bowie 2000; Lillie-Blanton et al. 2000). My dissertation research is an example of a culturally informed approach to the design and evaluation of technological health interventions. I found that taking such an approach is not straightforward; for example, while my participants expressed a value and desire for cultural recipes (Chapter 5) in my evaluation of Community Mosaic, I found that those users rarely shared such cultural food information (Chapter 6). In addition, while many participants described valuing cultural foods (Chapter 5) I also had participants react against having their cultural uniqueness emphasized too much (Chapter 3). Thus, it is critical for HCI designers to closely examine the interplay of culture and health and how technology might disrupt, resonate with, reflect or reject this interplay.

My dissertation work also revealed other ways in which the study of culture in the context of technology design is a complex process, requiring great care and in-depth study. For example, I found that the research instrument that I used limited my ability to comprehensively evaluate my participants' views on individualism and collectivism. As I discussed in Chapter 6, I used a 14-point survey developed by Sivadas *et al*. to examine my participants' position within the Horizontal-Vertical/Individualism-Collectivism Framework (Sivadas, Bruvold and Nelson 2008). However, classifying them as horizontal or vertical and individualistic or collectivistic did not tell me *why* participants had varying perspectives on group versus individual values and hierarchical versus egalitarian views on the world. Understanding the reasons for their varying perspectives would have helped to better contextualize their subsequent use of and reaction to the system.

In addition, the survey I used did not unpack to what extent participants' collectivistic and individualistic views persisted in different contexts. As I discussed in Chapter 2, some researchers have argued that people are not one-dimensional and simply always collectivistic or always individualistic (Komarraju and Cokley 2008). Instead, people may possess both values and each value may be activated in different settings. Thus, whereas a person might feel individualistic when it comes to thinking about their finances and to what extent it is important for them to help out family and friends in economic need, they may feel collectivistic when it comes to the topic of helping fellow community members to manage their health more effectively. The survey that I used,

while an instrument that previous health researchers have validated, did not ask questions that would tease apart respondents' collectivistic versus individualistic views on health.

Furthermore, even if the survey had asked questions of this sort, it would provide only a surface understanding of participants' values. While quite useful for identifying trends amongst participants, through my dissertation work I have found that, when trying to understand cultural values and perspectives, supplementing survey data with more in-depth qualitative data is crucial. For example, through my qualitative data, I was able to uncover issues such as the concern that some participants had that African Americans are often unfairly singled out as having health issues and that they are negatively portrayed in the current medical discourse. As researchers continue to examine the relationship between culture and health, and what this means for technology design and how health systems are adopted, it will be important to conduct mixed method studies that leverage the benefits of quantitative methodologies, which provide useful trending information, and qualitative methods, which provide deeper and richer insight into the meaning, values and perspectives that underlie those trends.

For example, one important extension of my work would be to study participants' views on individualism and collectivism in more depth prior to having them use CM. By supplementing survey data with interviews, ethnographic observations or cultural probes (Gaver, Dunne and Pacenti 1999), I would gain a richer understanding of the extent to which participants felt that caring for the health of their community was something important for them to do, particularly as a result of their shared membership in the African American cultural group. This insight would help to better contextualize participants' subsequent use of and reaction to a collectivistic health system such as CM.

The design space for future health technology is wide open. There are many aspects of ethnic culture that remain to be explored in terms of how values, traditions and beliefs may affect the way in which health systems should be designed and how they will be adopted. One starting point for future work would be to build upon the work of Hofstede *et al.*, who identified a set of dimensions across which cultural groups can be compared (Hofstede, Hofstede and Minkov 2010). While this research has been frequently used in organizational settings, the dimensions overlap with cultural traits explored within the health literature and as such provide one example of how researchers

can systematically examine cultural differences in health across groups. These dimensions are: *power distance* (expectations of power distribution), *masculinity versus femininity* (the distribution of roles between genders), *uncertainty avoidance* (tolerance for ambiguity and lack of structure), *long-term versus short-term orientation, individualism versus collectivism*, and *indulgence versus restraint* (the extent to which gratification of enjoyment-related desires are allowed or regulated). Each of those dimensions has potential implications for individuals' health and wellness. Indeed, as I have shown in my dissertation research, the dimension of individualism-collectivism is an important one to consider. Research on uncertainty avoidance has also been valuable in determining how to communicate the health risk of various behaviors to different groups (Beaudoin 2007).

While Hofstede *et al.* provide a useful framework for examining culture, some researchers have argued that such a taxonomic approach to characterizing culture is not ideal (Irani et al. 2010; Marsden, Maunder and Parker 2008). Alternative approaches include *generative* ones that examine how culture is dynamic – not a static characterization – and as such reproduced and continually unfolding as people experience and interact with the world. As I mentioned earlier in this section, through my dissertation work I certainly saw the need for future work that does not just examine the presence or absence of a trait such as collectivism but the reasons for which individuals have such values and the way in which cultural perspectives shape how people use technology. Various approaches to cultural investigation have their strengths and weaknesses, and future work should examine which approaches are particularly useful for understanding the interplay of culture, health and technology design. The taxonomic view of culture put forth by researchers such as Hofstede *et al*. may provide a useful starting point, helping researchers orient themselves and identify an initial area of focus (Hofstede, Hofstede and Minkov 2010). Continuing one's examination of culture with a generative approach may then yield a richer understanding of end-users' views and socio-technical interactions. In addition to conducting their own investigations, HCI researchers should leverage, as I have in my work, the growing body of work on culture in the public health and medical domains. Once an understanding of the culture-health relationship is obtained, it will be important for future work to examine how to design health

applications that reflect the relationship between cultural dimensions and health. Furthermore, when we examine health disparities in groups whose disproportionate experience of disease is impacted by cultural traditions and values, it is especially critical to examine culture.

Studying culture means understanding the beliefs, values, practices and other social regularities that characterize the general group but also how the cultural nuances are played out in the lives of individual people under study. Indeed, as I found in my dissertation work, and as has been recently pointed out by others (Irani et al. 2010; Marsden, Maunder and Parker 2008), it is critical to not simply understand broad cultural traits but how, and if, such traits play out in the lives of the individuals we study. To make significant progress in this area, future work should seek to systematically develop theories of explaining and studying socio-technical interaction in different cultural contexts to help ground future system development and evaluation. Such theories should account not only for the identification of broad cultural traits but also micro-level variations in how these traits are manifested.

8.3 Using ICTs to Address Health Disparities in Developed Nations

A growing number of researchers are exploring how to use ICTs to address poor health outcomes in developing countries (*e.g.,* (Cheng, Ernesto and Truong 2008; Ho, Owusu and Aoki 2009; Luk, Ho and Aoki 2008; Ramachandran et al. 2010)). At the same time, many health disparities exist in developed nations as well, and these issues necessitate serious focus (M. Marmot 2008). As I have discussed in this dissertation, as compared to Caucasians, various ethnic minority groups (such as African Americans, Hispanic Americans and Native Americans) disproportionately experience many health problems. Examples of these problems include higher rates of cancer-related death, diabetes, obesity, and pregnancies that result in low-birthweight infants[27].

The challenge of addressing health disparities in low-income settings within the developed and developing world is in some ways similar. In both settings, low-income

[27] U.S. Office of Minority Health: http://minorityhealth.hhs.gov/templates/browse.aspx?lvl=1&lvlID=2

individuals typically have fewer resources to help them maintain a healthy lifestyle (*e.g.,* a lack of economic resources or access to health services). In addition, the group under study may be culturally different than that of the research team, necessitating, as I discussed above, a thorough investigation of the cultural forces affecting the population's health-related behaviors and attitudes. At the same time, there are ways in which the developing and developed country contexts are quite different (Brewer et al. 2006). Those in the developed world – even those who are low-income – may still have access to more infrastructural resources (*e.g.,* power and Internet access) than their counterparts in the developing world. There may also be different political conditions and economic structures in each setting, which would affect governmental resources and support for healthcare. More advanced public transportation systems in developed nations may mean that individuals' patterns of movement in urban settings may vary, affecting for example, the ease with which they can get to clinics or access other resources. These differences mean that a different set of tools can be feasibly designed and imagined for underserved populations in the developed world as compared to those developing countries.

In summary, in addition to focusing on healthcare for the underserved in the developing world, we must not lose sight of the important and distinct health disparity issues in the developed world. Just as there is a growing body of work within HCI to examine healthcare in the developing world, a similar research agenda is needed in the developed world. Such an agenda should seek to create technology that innovatively improves the wellness of groups who are economically disadvantaged as well as ethnic minority groups who have poor health outcomes – two groups that have been underexplored within HCI health research to date. In my dissertation, I focused on nutritional issues within African American adults, particularly those in low-income communities. There is much work still to be done in this space and the discussion points that I presented in the Chapter 7 provides a number of considerations for researchers interested in taking a community-based approach.

There are also a number of other potential ways in which HCI research can address health disparities in the future. For example, maternal health is an important concern in low-income contexts. As such, future research could examine how to support low-income women in having healthy pregnancy outcomes (*e.g.*, normal birth-weight

babies) by addressing issues of stress, lack of social support, poor nutrition or limited prenatal care. These factors all negatively affect the health of the child (Shore and Shore 2009), and designing low-cost technological interventions may be a promising approach to improving the health of mothers and their babies. For example, one approach would be to examine how technology can help better meet the health-related informational and social support needs of these women.

Childhood obesity is another important concern, particularly in low-income households (Chamberlin et al. 2002; Falb and Kany January 2006; Horowitz et al. 2004; Kumanyika and Grier 2006; Morland et al. 2002). One challenge is that kids in this context watch more television and subsequently are frequently exposed to the advertisement of unhealthy foods and thus likely to consume unhealthy snacks (Epstein et al. 2008; Kumanyika and Grier 2006). Addressing this issue requires innovative interventions that account for the complex relationship between the messages that kids absorb from TV, how these messages affect their behaviors and attitudes, and the foods that parents make available (Bergsma and Carney 2008; Epstein et al. 2008; Hindin, Contento and Gussow 2004; Kumanyika and Grier 2006). Given the positive impact that digital games have had on child health (Baranowski et al. 2003; Baranowski et al. 2008; Brown 1997; Lieberman 1995), one direction for future work would be to develop a digital game that helps kids learn how to evaluate the healthiness of foods advertised on TV. Researchers could examine to what extent such a game leads kids to ask their parents for healthier foods and how to encourage and support parents in providing more nutritious options for their children.

Finally, research has shown that cultural groups have varying levels of trust in the healthcare establishment (Gamble 1993). In particular, some cultural groups who disproportionately experience health issues have less trust in healthcare providers (LaVeist, Nickerson and Bowie 2000; Lillie-Blanton et al. 2000). Thus, it would be beneficial to examine how trust of the healthcare establishment affects patients' experience with health technology. In my dissertation research, my systems supported peers in sharing experiential knowledge around healthy eating. In the future, it would be valuable to examine whether, for example, people who have a distrust of the medical establishment are more likely to trust and value (potentially subjective) peer-shared

health information in computer-mediated settings, as compared to those who trust the medical establishment.

8.4 Concluding Remarks

The two themes that I have discussed in this chapter reflect two of the bodies of work that my dissertation research contributes to: HCI research on culture and work on health disparities. My research is also a significant contribution to the growing body of work on collaborative health applications. Indeed, over the past few years, interest in social health applications has skyrocketed. Many government, non-profit and for-profit health organizations are eagerly adding social media components to their websites, or using social media to disseminate information (*e.g.,* Twitter and Facebook[28]). Furthermore, an increasing number of HCI researchers, including myself, have explored the design of collaborative health applications that help individuals manage their health with others (Anderson et al. 2007; Consolvo 2006; Grimes, Landry and Grinter 2010; Grimes et al. 2008; Mamykina et al. 2008; Mueller, O'Brien and Thorogood 2007). Yet, in the midst of this technological innovation, research must also examine the drawbacks and challenges of social health systems. For example, privacy and security become a major concern when designing applications that facilitate the transfer of sensitive health information (*e.g.,* personal health data that one shares with one's doctor or family) both in terms of that information getting into the wrong hands and in terms of people inadvertently disclosing information that they actually feel should be kept personal (Grimes, Tan and Morris 2009; Tang et al. 2006). Future work must continue to soberly approach the design of social health systems, unpacking the concerns that can arise from their use along with their potential for positive impact.

The discussion points that I presented in Chapter 7 provide a starting point for the future design of health applications for an underexplored social unit: the community.

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[28] Examples include the NIH (www.facebook.com/nih.gov), the White House's Let's Move! Campaign, (http://twitter.com/#!/letsmove), Humana (http://twitter.com/#!/humanagames) and the Washington Global Health Alliance's recent workshop on using social media in the nonprofit sector (http://www.wghalliance.org/events/utilizing-social-media-nonprofit-sector) .

Future work should attempt to further characterize the unique considerations that should be made when focusing on the community, but also when exploring social contexts such as coworkers, the family unit or child peer groups (Anderson et al. 2007; Consolvo 2006; Grimes, Tan and Morris 2009; Toscos 2008). This work should seek to better understand the nuances of these distinctive social groups and how these nuances affect shared technology usage around health. The social dynamics in different contexts may lend themselves to different kinds of designs, and mapping out the social health technology landscape will help build our understanding of the benefits and limitations to different technological approaches to health promotion. Finally, I urge future research to reflect upon the role that culture plays in shaping health behaviors, the subsequent implications for design and to consider how culturally-grounded technology design can be used to address the serious health disparities that exist in both developed and developing nations.

APPENDIX A: RESEARCH INSTRUMENTS FOR INITIAL FORMATIVE FIELDWORK

A.1 Semi-Structured Focus Group Guide

Opening Question

1. Name, how long you've lived in the Atlanta area.

Introductory Questions

2. What are your favorite foods to eat (why)?

Transition Question

3. Describe what you had to eat today.
    a. Is that typical?
    b. What time do you usually eat at? Do you always eat at the same time?

Key Questions

4. What does it mean to be 'healthy'?
    a. What kinds of foods do you consider to be healthy?
    b. Is the thought of eating healthy appealing or not?
    c. How do you learn what it means to be healthy?
    d. Do you think you have time to make/think about healthy food choices?
5. How did your upbringing affect your eating habits?
    a. E.g. traditional foods, parents' habits
6. Talk about your immediate family's eating habits.
    a. What do they typically eat?
    b. Does your family influence how you eat?
    c. Do any of them have diabetes, high blood sugar? If so, how do they deal with it?
    d. What do you teach your kids about being healthy?
7. What motivates you to eat? Social? Sustenance? Coping? Celebration?
8. How do you eat compared to friends/coworkers?
    a. What do they typically eat?
    b. Do you eat the same things they do?
9. How does your community affect the way you eat?
    a. Do you feel you have access to the foods you want to eat?
    b. Have you attended any community health info sessions?
    c. Do people in your neighborhood eat out? If so, where do they go?
    d. Where do you buy groceries?
10. How do you decide what to eat, for example, for dinner (monetary, whatever's in fridge, convenience)?
    a. When you shop for groceries, what types of things do you buy?
    b. How did you learn how to cook?
    c. How do you learn recipes now?
11. Have you ever tried to change your eating habits?
    a. Why did you make the changes?
    b. What kinds of changes?
    c. What worked well?

d. What didn't work well?
e. How did you learn?
f. Do you feel you need/should change your current eating habits?

12. Do you think Black people eat differently than other ethnic groups?
    a. Is there anything about being 'Black' that affects your daily life?
    b. Have you heard that we have more diabetes and high blood pressure than other groups of people? That Whites in Fulton County live 7-10 years longer?
    c. Why do you think this is?
13. What are the current barriers to eating healthy foods, being 'healthy'?
14. What are current things that help you eat healthy?

Closing Questions

15. Is there anything you'd like to change about the way you eat?

A.2 Participatory Design Session Guide

1. Overview this session (5 mins)
    a. This is a way for them to share their ideas with us about what technologies & health activities are important to them.
    b. There are no right/wrong ways to do this!
2. Go through each card set (10 minutes)
    a. Explain that there are technology cards and health cards
    b. Show card, explain technology/activity
3. "Rules" (5 mins)
    a. Match cards that you feel go together, or you think should go together
        i. E.g. barcode scanner & nutrition labels
    b. Tape cards together on board. As many cards as you like.
    c. If you think of other things, use blank note cards and write/draw on them.
    d. Use Markers to make notes
    e. Each person will explain board at end
    f. I am not an artist so you don't have to be on either! Just do your best!
4. Any questions? (5 mins)
5. Make Piles (7 mins)
    a. Health Cards
        i. activities done before or are interested in for future
        ii. others
    b. Technology Cards
        i. technology you like/neutral
        ii. don't like
6. Matching! (15 minutes)
7. Add stickers (5 mins)
    a. People
    b. Settings
8. Discussion (25 mins)
    a. Say what you put on your board & why
    b. Probe their decisions

Total Time: About 1 hour, 20 minutes.

APPENDIX B: RESEARCH INSTRUMENTS FOR EATWELL EVALUATION

B.1 Interview #1 Semi-structured Interview Guide

Preparation

1. Look at usage (records and listens)
2. Look at survey

Questions

Probe individual usage patterns.

1. Tell me about your experiences using the system. (e.g. did you remember to use system, to check for messages & leave messages). Initial impressions? [5min]
2. Any category that is most interesting? Most important to you?
3. Did you listen to any messages? Describe the messages you listened to. [7min]
    a. YES
        i. Did listening to the messages effect you in any way (e.g. make you change your habits?)
        ii. Tell me about listening to the messages of people you don't know
        iii. Did you start to recognize any of the voices?
        iv. Did hearing messages cause you to leave your own message?
        v. What did you think about the way messages were played?
            1. What do you think about the fact that newest played first?
            2. What do you think about the way you're able to navigate the messages?
    b. NO
        i. Tell me about why you didn't listen to any messages.
        ii. Could you see yourself ever listening to any?
        iii. What would make you want to listen to some?
4. Did you leave any messages? [7min]
    a. What made you want to leave a message? What prompted you to remember the system?
    b. What was your goal in creating the messages?
    c. Where were you when you left the messages?
    d. Did listening to others' messages affect the messages you left? (e.g. make you want to leave one, spark an idea)
    e. Leaving messages for people you don't know?
        i. Rather leave for people you know?
        ii. How comfortable/uncomfortable were you in leaving the message?
    f. Would you like to know who is listening to your messages/their reactions to them?
5. Did you ever decide NOT to leave a message?
6. Anything you like about the system? [4min]
7. Have you encountered any problems, challenges, or things you'd like to change? [4min]

8. Do you know anyone else who is participating in the study?
9. What did you think of the SMS update?
    a. Useful?
    b. Remind you to use the system?
10. Scale of 1-5, how would you rate your health knowledge? (1=No knowledge, 3=average, 5=expert)
11. Scale of 1-5, how healthy do you consider yourself? (1=Not at all, 3=moderately, 5=very)
12. Know anyone else who might like to use the system?
13. Can you imagine using this system apart from this study?
    a. What would it take to make you want to use it in your normal life?
14. Have you participated in other online discussion boards? How does this compare?

<u>To Do</u>

1. Schedule next interview,
2. Let them know how many more weeks they should use it and encourage them to keep using it.

B.2 Interview #2 Semi-structured Interview Guide

Some questions will be duplicated. If your answer is same as last time, that's ok!

Usage Patterns

1. Tell me about your experiences using the system. (e.g. did you remember to use system, to check for messages & leave messages)
2. Did you listen to any messages? HOW DID YOU DECIDE WHAT TO LISTEN TO?
    a. Any messages stand out to you? Talk about those…
3. Did you leave any messages?
    a. What made you want to leave a message?
    b. What was your goal in creating that message?
4. What category were you most interested in LEAVING messages? Why?
5. What category were you most interested in LISTENING to messages? Why?
6. What was the one thing that made you use the system the most? *(Desire to help others, I asked you to, desire to hear what others had to say, etc.)*
7. Anything you like about the system?
8. Have you encountered any problems, challenges?
9. Things you'd like to change?
10. What did you think about leaving voice messages? (as opposed to SMS, etc.?)
11. Do you have a preference of who you would rather use this with - people you know or people you don't know?

Culture

12. The messages left in EatWell were typically personal accounts. Compare using this system to receiving that type of personal information to other information sources that might give nutrition information that is less personalized (e.g. books on healthy living, magazines articles, etc.).
    a. Any benefits to EatWell over that?
    b. Any disadvantages to EatWell compared to that?
13. How relevant did the information in EatWell seem to you, given your cultural background – African American, the environment you live in, etc.
    a. How could it have been made more relevant?

Affects on Attitudes & Behaviors

14. Did using EatWell effect you in any way
    a. Did it affect your attitudes about health?
    b. Affect your behaviors – make you change habits? (e.g. make you change your habits? Think more about health?)
15. Feel like it helped you learn more about eating healthfully in your neighborhoods?
16. Affected your interest in learning at all?

Future Versions

17. Could you see yourself using this type of system in the future? Why or Why not?
18. What would you change for future versions?
19. If you were to use in the future, what would compel you to use the system?

20. Imagine you could use different types of media, would you want to?
    a. E.g. Instead of or in addition to voice: text comments, pictures (e.g. of places), video…

APPENDIX C: RESEARCH INSTRUMENTS FOR FORMATIVE COMMUNITY MOSAIC STUDY

C.1 Semi-structured Focus Group Guide

Opening Questions

1. State your name, how long you have lived in the Atlanta area, and how far away you live from the YMCA. (1 min)
2. Let's talk about a typical day coming into the YMCA. (5 mins)
    a. Do you stop and talk to others? What are the conversations about? Where do you usually stop?
    b. How often do you recognize people?
    c. How important is it to you to talk with or get to know other YMCA members?
    d. Do you stop to look at the flyers that are up in the lobby?

Transition Question

3. What does being "healthy" mean to you? How would you define this? (3 mins)

Key Questions

4. Talk about the state of nutrition in this community. (4 mins)
    a. Do you think people are eating healthfully overall? Why/why not?
        i. Are you? Why/why not?
    b. What are the things in the community that help people to eat healthfully?
        i. E.g., services, restaurants, grocery stores
        ii. Personal strategies?
    c. What are the barriers to eating healthfully?
        i. Personal obstacles?
            1. E.g. is money barrier?
            2. In what ways do you think you need support with eating healthfully?
    d. What things need to be done to help people in this community eat more healthfully?
5. How important is it for the community to work together to make sure people are eating healthfully? (5 mins)
    a. In what ways can the community work together to encourage residents to eat more healthfully?
    b. In what ways do you help others try to eat healthfully?
        i. Who & how?
    c. Do you feel equipped to help others eat healthfully? Why/why not?
6. Do you feel the African American community faces issues with eating healthfully that are unique? Or is eating healthfully more of an "American" issue? (3 mins)
    a. Do you think there is such a thing as "African American food"?
        i. If so, what is it? And, how often do you eat it/think the community eats it? Assess its healthiness.
        ii. If not, why not?

7. What emotions come to mind when thinking about the state of healthy eating in this community? (E.g. pride, …)

Card Activity (15 mins)

8. We're interested in designing a technology that can help people in the community work together to promote healthy eating in this community. We have a stack of cards, each card has a different way in which community members can address the topic of healthy eating. I'm going to explain each of the cards. After I do this, I'll ask you to pick the ones you think would be most beneficial for the community and the ones that would be least beneficial. [EXPLAIN CARDS] (stop, take pictures)
9. Choose the 3 most beneficial, 3 least for community.
10. Each person, please explain why you chose each card in terms of why they are the least and most useful strategies.
    a. *Are your selections based on previous experiences that you've had?*

APPENDIX D: RESEARCH INSTRUMENTS FOR HCI EXPERT EVALUATION OF COMMUNITY MOSAIC PROTOTYPE

D.1 Session One Guide

1. Thank you for participating!
2. Go over consent form
3. Survey
4. Explain CM concept
    a. Goal of this project: promote healthy eating in low-income African Americans.
    b. We are going to be testing CM out amongst HCI folks in TSRB first, to test feasibility of concept & work out the kinks.
    c. This is a pilot! So there may be bugs etc, please bare with us. We are hoping to get any and all feedback on your experience using the system as a user, as well as your opinions on the UI/concept from an HCI expert point of view.
    d. Community Mosaic: lets people share with others in their local community how they are trying to eat healthfully. For this study, the "local community" is people in TSRB. The idea is that people take pictures of ways that they are trying to eat healthfully today. E.g. eating a granola bar. You then compose an MMS message, consisting of the picture and an optional text caption describing what you are doing.
    e. Send the MMS to the CM phone number: xxx-xxx-xxxx.
    f. You will get a reply telling you that you can share how you're feeling when you took the picture, this is the "emotion tag". You will see a list of 5 emotions, you can either reply with the # of one of the emotions or do nothing. Your content (picture+caption) will be stored either way.
    g. You can text HELP at anytime to the CM number to get a basic overview of how to use the system.
    h. The content that people send will be visualized on the CM display. In our real deployment, this will be on a touch-screen monitor. For now we will show it on a large monitor when you come back in next week.
        i. Screenshot.
            1. Atlanta skyline
            2. Windows: each one shows a different message that's been sent to CM
            3. Content sent today: blue, old content: white
            4. Click on a window to get the details
                a. Time/date sent, picture, caption
                b. Commit button
                c. Info on # times committed, viewed
5. Task for week
    a. Are you familiar with sending MMS messages on your phone?
    b. Comfortable doing so with respect to the charges you may receive from your carrier?

    c. Let's put the CM phone number in your phone as a contact: 678-650-9497
    d. Please send at least 2 messages to Community Mosaic between now and the next session. You can send as many as you want!
        i. Important: please send 1 message on the day of your next session
    e. *Note to researchers: We should send reminder to do this.*
6. Next week you'll see your messages visualized, along with others in the study & give your feedback on the system
    a. So the other study members will be able to see what you've sent and vice versa.
7. What is your availability for next week?
8. Thank you! We will email you your time for next week by Monday.

D.2 Session 2 Guide

PART 1: Focus Group Questions - Reflecting on past week (30 minutes)

1. Describe your overall experience creating and sending content to CM over the past week.
2. How did you decide what to take pictures of?
    a. How challenging or easy was it to make this decision?
    b. Did you ever think about taking a picture and then change your mind? If so, what made you change your mind?
    c. Did the fact that others would be able to see the content you shared affect what you chose to share? If so, how?
3. How did you decide to add/not add a caption?
    a. How much effort was it to add a caption (e.g. too cumbersome, easy, etc.)?
4. What did you think about the emotion tags?
    a. Did you feel any desire to share how you were feeling? Why/why not?
        i. If YES, what kinds of emotion did you want to express? **Consistency and Standards**
            1. Did the CM emotion tags match feelings that you wanted to convey? Why/why not?
        ii. If NO, why not?
    b. How did you feel about having to send content in a 2-stage process (first sending MMS then sending emotion tag)?
        i. Would you have preferred to enter the emotion tag in your original message? **Flexibility and efficiency of use (novice vs. expert users)**
    c. Did you ever send multiple emotion tags for one message (either successively or concurrently)? Why?
5. How long did it usually take you to receive a response to your messages (e.g. was there any delay)? **Visibility of system status**
    a. How did the speed of the system response messages affect your experience?
        i. Specifically, did it affect your opinion of the system and desire to want to send content?
6. How confident did you feel that your content was received? What made you feel confident or unsure? **Visibility of system status**
7. What did you think about the system messages you received? **Visibility of system status**
    a. Were the messages understandable? Why/why not?
    b. Were they useful? Why/why not?
        i. Should the system respond at all?
    c. Did they become less or more useful over time (after you had experience sending content)? **Flexibility and efficiency of use (novice vs. expert users)**
    d. How could the system response messages be made more useful?
        i. E.g. what kind of information would be useful to get from the system after you've submitted your content.
8. Describe any challenges you faced sending content. E.g. any challenges sending MMS?
    a. Did you ever feel like you needed help from the system? **Help and documentation**
        i. If so, did you feel like you were able to get the appropriate help?
    b. Did you ever have any problems that you did not know how to diagnose the cause of or recover from? **Help users recognize, diagnose, and recover from errors**
9. What reminded you to use the system?

a. What would have helped you to remember to use the system?
b. E.g. would SMS reminders have been useful? Custom CM cell phone case?

PART 2: Think Aloud Evaluation (15 minutes)

Show interface, how to interact with it: Main screen & detail screen. Explain skyline/window aspect.

Instructions: Explore the GUI. Look at the main screen (skyline) and click on building windows to view the details. Try clicking the commit button for any things that you might actually like to try. As you go through the interface, say what you're thinking (check for Match between system/real world). For example, state how intuitive you find the CM display interface and your reactions to the building/window metaphor, the content you see on the screen, the buttons, etc. Take turns navigating the screen.

PART 3: CM Display Interface Questions (25 minutes)

10. How do you feel about others being able to see the information you've shared over the past week?
11. If others could see the content you shared, do you think it might help them to eat healthfully?
    a. Why/why not?
12. What do you think about the content that others have shared?
    a. Do you care about seeing it? Why/why not?
    b. Anything about the strategies that they've shared that you would have wanted to know more about?
    c. Can you see it being useful at all (e.g. in helping you to eat healthfully)? Why/why not?
13. Right now, you can only view content that others have shared by looking at this screen. Would you want to be able to keep a copy of the content?
    a. How would you want to store this information? Electronically, paper, other? Why would you want to keep a copy?
14. What do you think about the emotion tags you saw?
    a. How useful/not useful were they?
15. What are your thoughts about the Commit button? Match between system/real world
    a. Do you see yourself ever pressing it? Why/why not?
16. Anything in the detail window that is unnecessary? Aesthetic and minimalist design
17. Anything in the main window that is unnecessary? Aesthetic and minimalist design
18. Would you have contributed to this system had we not asked you to? Why/why not?
19. Do you think that using CM would encourage you to eat more healthfully?

PART 4: Final comments & remarks (10 minutes)

20. We plan to install a completed version of CM in TSRB. Could you see yourself using CM in the future?
    a. Why/why not? What would compel you to use it?
    b. What would need to change for you to use it?
    c. What would make you share/not share content?
21. What other features do you wish CM had?
22. Any other comments/suggestions?

APPENDIX E: COMMUNITY MOSAIC FIELD STUDY MATERIALS

E.1 Pre-intervention Survey

PID: _____

COMMUNITY MOSAIC STUDY: **INTRODUCTORY SURVEY**

Instructions: Please read each question *carefully* and mark your responses *clearly* below.

Part 1

1. What is your gender? _____ **Male** _____ **Female**
2. Which age group do you fall into?
   _____ **18 – 27**
   _____ **28 – 37**
   _____ **38 – 47**
   _____ **48 – 57**
   _____ **58 – 67**
   _____ **68 – 77**
   _____ **78 – 99**
3. What is your ethnicity?
   _____ **Black/African American** _____ **Hispanic/Latino** _____ **Asian**
   _____ **White (non-Hispanic/Latino)** _____ **Other (**please describe: _____)
4. What zip code do you live in? _____
5. How long does it take you to get to the Southwest Atlanta YMCA from your home (in minutes)? _____
6. Are you married? _____ **YES** _____ **NO**
7. How many children do you have? _____
8. How many people (children and adults, including yourself) live in your home? If you share custody of any children, please include them. _____
9. How many people in your household fall into these age groups (NOT including yourself)?

0 – 2 years	_____
3 – 4 years	_____
5 – 8 years	_____
9 – 11 years	_____
12 – 17 years	_____
18 – 30 years	_____
31 – 45 years	_____
46 – 60 years	_____
Over 60 years	_____

PID: _____

10. What is the highest level of education you have completed?

_____ **Less than high school**

_____ **High School Diploma/GED**

_____ **Associate's Degree (A.A., A.S., etc.)**

_____ **Bachelor's Degree (B.S., B.A., etc.)**

_____ **Graduate Degree (M.S., Ph.D., J.D., etc.)**

11. Are currently employed? _____ **Yes** _____ **No** _____ **Retired**

12. If you are employed, what is your job? _____

13. Do you receive food stamps? _____ **YES** _____ **NO**

14. Please list the jobs that the other members of your household have:

Person #1 _____

Person #2 _____

Person #3 _____

Person #4 _____

Person #5 _____

15. What is your total household income per year?

_____ **below $13,000**

_____ **$13,000 to $18,000**

_____ **$18,001 to $22,500**

_____ **$22,501 to $27,000**

_____ **$27,001 to $31,500**

_____ **$31,501 to $40,500**

_____ **$40,501 to 45,000**

_____ **$45,501 to $60,000**

_____ **$60,000 to $100,000**

_____ **over $100,000**

Part 2

16. Who cooks most of the meals in your household?

_____ **I do** _____ **Another member of my household** _____ **No one**

17. How many times per week do you eat at restaurants (fast food and sit-down)?

_____ **Never** _____ **Few times/year** _____ **Few times/month** _____ **Few times/week** _____ **Few times/day**

18. How many times per week do you eat meals that you have cooked at home?

_____ **Never** _____ **Few times/year** _____ **Few times/month** _____ **Few times/week** _____ **Few times/day**

PID: _____

19. What things affect the way that you eat? (Check all that apply.)

_____ **What your family or friends want to eat**

_____ **What you feel like eating**

_____ **The healthiness of the food**

_____ **The cost of the food**

_____ **How far you have to travel to get the food**

_____ **How quickly the food can be made or is available**

_____ **Other** (Please describe: _____)

20. How often do choose what to eat based on how healthy that food is?

_____ **Never** _____ **Occasionally** _____ **Most of the time** _____ **Always**

21. Are you satisfied with your eating habits? _____ **YES** _____ **NO**

Why/why not?

_____

_____

_____

22. Please check (√) which information you get from the following sources. (Check all that apply.)

Doctor: _____ **Nutrition Information** _____ **Recipe Information** _____ **Advice on Picking Restaurants**

Friends: _____ **Nutrition Information** _____ **Recipe Information** _____ **Advice on Picking Restaurants**

Family: _____ **Nutrition Information** _____ **Recipe Information** _____ **Advice on Picking Restaurants**

Church: _____ **Nutrition Information** _____ **Recipe Information** _____ **Advice on Picking Restaurants**

Internet discussion boards (websites where people talk about health topics by posting questions and answers):

_____ **Nutrition Information** _____ **Recipe Information** _____ **Advice on Picking Restaurants**

Other: (please describe: _____)

23. Who do you think can give you <u>useful and truthful</u> information about healthy eating? (Check all that apply.)

_____ **Doctor**

_____ **Friends**

_____ **Family**

_____ **Church**

_____ **Internet discussion boards** (websites where people talk about health topics by posting questions and answers)

_____ **Other** (please list: _____)

24. On a scale of 1-5, say whether or not you agree with the following statement: "Overall, people that go to the Southwest Atlanta YMCA on Campbellton Road can give me useful and truthful information about how to eat healthfully." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

PID: _____

25. On a scale of 1-5, how much do you think you know about eating healthfully? (Circle one number.)

1	2	3	4	5
Very Little		**Average Amount**		**A Lot**

26. On a scale of 1-5, say whether or not you agree with the following statement: "I am interested in learning how to eat more healthfully." (Circle one number).

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

27. On a scale of 1-5, say whether or not you agree with the following statement: "I know enough about healthy eating to give advice to my friends and family." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

28. On a scale of 1-5, say whether or not you agree with the following statement: "I know enough about healthy eating to give advice to people in my local community (e.g. neighbors, people that go to the YMCA)." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

29. On a scale of 1-5, say whether or not you agree with the following statement: "I talk about nutrition and/or healthy eating with people that I know (e.g. friends, family, coworkers)." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

30. On a scale of 1-5, say whether or not you agree with the following statement: "It is important for me to give advice about healthy eating to my friends and/or family." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

31. On a scale of 1-5, say whether or not you agree with the following statement: "I am responsible for how healthfully my *family* eats." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

32. On a scale of 1-5, say whether or not you agree with the following statement: "I am responsible for how healthfully my *friends* eat." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

33. On a scale of 1-5, say whether or not you agree with the following statement: "I can find healthy foods at supermarkets and restaurants in the general neighborhood that I live in." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

PID: _____

34. On a scale of 1-5, say whether or not you agree with the following statement: "I can find healthy foods at supermarkets and restaurants in the area around the Southwest Atlanta YMCA on Campbellton Road." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

Part 3

35. How high is your overall diet in fat? **(circle one answer below)**

Low
Very low
} *answer this question* →

How long have you followed a diet low in fat? (**circle one answer below**)

Less than 1 month
1 to 5 months
6 to 11 months
1 year or more

Go to Part 4.

In the middle
High
Very high
Don't know
} *Go to question 36.*

36. In the past 6 months, have you tried to eat *less* fat? (**circle YES or NO**)

YES } *answer this question* →

How successful were you in trying to eat less fat? (**circle one answer below**)

Very successful
Somewhat successful } *Go to Part 4*

Not successful } *Go to Question 38.*

NO } *Go to question 37.*

37. Are you seriously thinking about eating less fat over the next six months? **(circle YES or NO)**

YES } *Go to question 39.*

NO } *Go to Part 4.*

38. Do you plan to continue trying to eat less fat over the next six months? **(circle YES or NO)**

YES
NO
} *Go to Part 4.*

PID: _____

39. How confident are you that you can change your diet and eat less fat? (**circle one answer below**)

Very confident
Somewhat confident
Not very confident
Don't know

} *Go to Part 4.*

Part 4

40. On a scale of 1-5, say whether or not you agree with the following statement: "My happiness depends very much on the happiness of those around me." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

41. On a scale of 1-5, say whether or not you agree with the following statement: "I would do what would please my family, even if I hated that activity." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

42. On a scale of 1-5, say whether or not you agree with the following statement: "I usually sacrifice what I want for the benefit of my group." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

43. On a scale of 1-5, say whether or not you agree with the following statement: "I enjoy working in situations involving competition with others." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

44. On a scale of 1-5, say whether or not you agree with the following statement: "I enjoy being unique and different from others in many ways." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

45. On a scale of 1-5, say whether or not you agree with the following statement: "Children should feel honored if their parents receive an important award." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

46. On a scale of 1-5, say whether or not you agree with the following statement: "I often 'do my own thing'." (Circle one number.)

1	**2**	**3**	**4**	**5**
Strongly Disagree		**Neutral**		**Strongly Agree**

47. On a scale of 1-5, say whether or not you agree with the following statement: "Competition is the law of nature." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

48. On a scale of 1-5, say whether or not you agree with the following statement: "If a co-worker gets a prize, I would feel proud." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

49. On a scale of 1-5, say whether or not you agree with the following statement: "I am a unique individual." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

50. On a scale of 1-5, say whether or not you agree with the following statement: "I would stop doing an activity that I enjoy very much if my family did not approve of it." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

51. On a scale of 1-5, say whether or not you agree with the following statement: "Without competition it is not possible to have a good society." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

52. On a scale of 1-5, say whether or not you agree with the following statement: "I feel good when I cooperate with others." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

53. On a scale of 1-5, say whether or not you agree with the following statement: "The wellbeing of my co-workers is important to me." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

PID: _____

Part 5

54. How often do you visit websites with health-related discussion boards (where people post messages with questions and answers) or health-related chat rooms?

    _____ **Never** _____ **Rarely** _____ **Somewhat regularly** _____ **Regularly**

55. How often do you write messages on websites with health-related discussion boards or health-related chat rooms?

    _____ **Never** _____ **Rarely** _____ **Somewhat regularly** _____ **Regularly**

56. How often do you read messages on websites with health-related discussion boards or health-related chat rooms?

    _____ **Never** _____ **Rarely** _____ **Somewhat regularly** _____ **Regularly**

57. A *touch-screen display* is an electronic screen that you use by touching digital buttons on the screen. They are sometimes used at ATM machines and kiosks in stores and other public places. How many times have you used a touch-screen display?

    ____ **Never** ____ **Once or twice** ____ **A few times** ____ **Many times**

58. How often do you send and receive text messages (SMS) on your cell phone?

    ____ **Never** ____ **Few times/year** ____ **Few times/month** ____ **Few times/week** ____ **One or more times/day**

59. How often do you send and receive picture messages (MMS) on your cell phone?

    ____ **Never** ____ **Few times/year** ____ **Few times/month** ____ **Few times/week** ____ **One or more times/day**

60. How often do you take pictures on your cell phone?

    ____ **Never** ____ **Few times/year** ____ **Few times/month** ____ **Few times/week** ____ **One or more times/day**

61. How often do you look at pictures on your cell phone?

    ____ **Never** ____ **Few times/year** ____ **Few times/month** ____ **Few times/week** ____ **One or more times/day**

E.2 Post-intervention Survey

PID: _____

COMMUNITY MOSAIC STUDY

EXIT SURVEY

Instructions: Please read each question *carefully* and mark your responses *clearly* below.

Part 1

1. On a scale of 1-5, say whether or not you agree with the following statement: "Overall, people that go to the Southwest Atlanta YMCA on Campbellton Road can give me useful and truthful information about how to eat healthfully." (Circle one number.)

   1 2 3 4 5

   Strongly Disagree Neutral Strongly Agree

2. On a scale of 1-5, how much do you think you know about eating healthfully? (Circle one number.)

   1 2 3 4 5

   Very Little Average Amount A Lot

3. On a scale of 1-5, say whether or not you agree with the following statement: "I am interested in learning how to eat more healthfully." (Circle one number).

   1 2 3 4 5

   Strongly Disagree Neutral Strongly Agree

4. On a scale of 1-5, say whether or not you agree with the following statement: "I know enough about healthy eating to give advice to my friends and family." (Circle one number.)

   1 2 3 4 5

   Strongly Disagree Neutral Strongly Agree

5. On a scale of 1-5, say whether or not you agree with the following statement: "I know enough about healthy eating to give advice to people in my local community (e.g. neighbors, people that go to the YMCA)." (Circle one number.)

   1 2 3 4 5

   Strongly Disagree Neutral Strongly Agree

6. On a scale of 1-5, say whether or not you agree with the following statement: "It is important for me to give advice about eating healthfully to my friends and/or family." (Circle one number.)

   1 2 3 4 5

   Strongly Disagree Neutral Strongly Agree

7. On a scale of 1-5, say whether or not you agree with the following statement: "I am responsible for how healthfully my *family* eats." (Circle one number.)

   1 2 3 4 5

   Strongly Disagree Neutral Strongly Agree

PID: _____

8. On a scale of 1-5, say whether or not you agree with the following statement: "I am responsible for how healthfully my *friends* eat." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

9. On a scale of 1-5, say whether or not you agree with the following statement: "I can eat healthfully in the general neighborhood that I live in." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

10. On a scale of 1-5, say whether or not you agree with the following statement: "I can eat healthfully in the area around the Southwest Atlanta YMCA on Campbellton Road." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

Part 2: Community Mosaic

11. Over this 2-month research study, about 273 messages were shared by 39 people in Community Mosaic. What do you think about the number of messages that were shared (check one answer)?

_____ **It seems like a lot of messages.**

_____ **It seems like a small number of messages.**

_____ **I'm not sure what to think.**

12. How many times did you look at messages on the Community Mosaic kiosk in the YMCA?

____ Never ____ Once ____ 2-3 times ____ 4-7 times ____ 8 or more times

13. On average, how long did you spend looking at the Community Mosaic display each time you visited the kiosk?

____ A few seconds ____ About a minute ____ A couple minutes ____ More than a couple minutes

____ I never looked at the Community Mosaic display/I never saw it working

14. If you looked at messages on Community Mosaic, overall, how useful were they for helping you to eat healthfully?

____ Not useful ____ Somewhat useful ____ Very useful ____ I did not look at messages

15. Did you ever press any of the "Community Response" buttons ("e.g. the 'I'm inspired' button)?

____ YES ____ NO ____ NOT SURE

Why/why not?

_____

_____

_____

PID: _____

16. Please describe anything that you *liked* about Community Mosaic:

_____

_____

_____

17. Please describe anything you *did not like* about Community Mosaic:

_____

_____

_____

18. On a scale of 1-5, say whether or not you agree with the following statement: "I learned *new ways* to eat healthfully by using Community Mosaic." (Circle one number.)

1 2 3 4 5

Strongly Disagree Neutral Strongly Agree

19. On a scale of 1-5, say whether or not you agree with the following statement: "Using Community Mosaic made me want to eat more healthfully or to continue eating healthfully." (Circle one number.)

1 2 3 4 5

Strongly Disagree Neutral Strongly Agree

20. Have you tried any of the healthy eating ideas that were shared in Community Mosaic? _____ **YES** _____ **NO**

If YES, please describe what you have tried:

_____

_____

_____

_____

If NO, please describe any things that have kept you from trying out the ideas:

_____

_____

_____

21. On a scale of 1-5, say whether or not you agree with the following statement: "After this research study is over, if Community Mosaic was still available at the YMCA, I would send messages with my healthy eating ideas." (Circle one number.)

1 2 3 4 5

Strongly Disagree Neutral Strongly Agree

PID: _____

22. On a scale of 1-5, say whether or not you agree with the following statement: "After this research study is over, if Community Mosaic was still available at the YMCA, I would look at messages on the kiosk." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

23. On a scale of 1-5, say whether or not you agree with the following statement: "I help to improve the health of my community by sending messages to Community Mosaic." (Circle one number.)

1	2	3	4	5
Strongly Disagree		**Neutral**		**Strongly Agree**

E.3 Semi-structured Interview Guide: Interview #1

I have an interview guide, asking questions. I'll be steering the interview to make sure on time.

1. Were you able to use the CM display at all?
2. Please tell me your overall reactions to Community Mosaic.
3. Have you sent any messages to the system?
    a. If NO, what has stopped you from doing so?
    b. If YES, please describe that experience.
        i. how did you decide what to send?
        ii. How did you decide between taking a picture & sms?
        iii. Tell me about the process of taking a picture – lighting/staging/etc.
        iv. Tell me about the process of writing a message – deciding what to say, how much to say, what to talk about et c.
        v. How did you decide when to send just a pic or pic+txt
        vi. Did you ever take a picture and decide not to send it? Tell me about that.
        vii. Did you ever feel self-conscious about what you were sending?
        viii. how confident did you feel that the message would be useful?
        ix. What made you decide to send a message in? What was your motivation?
        x. Did sending messages make you reflect upon your own eating habits at all?
        xi. Did sending messages make you think about the ease/difficulty of trying to eat healthfully?
        xii. Did you feel like you had useful ideas to share?
        xiii. Did you feel that you eat enough healthy foods to have content to share?
    c. How easy/hard was it to remember to send messages?
        i. Did you send messages around meal times?
    d. What prompted you to remember to send messages?
4. What did you think about the weekly update messages?
    a. What did you think when you saw the # of messages sent this past week?
    b. Did they ever tell you that people were inspired to try the things you sent?
        i. How did that make you feel?
5. Have you looked at any of the messages on the display in the YMCA?
    a. If NO, what has stopped you from doing so?
    b. If YES, please describe that experience.
        i. Did you see any messages that were useful for you?
        ii. Were the messages of any interest to you?
            1. What made them interesting to you?
        iii. What pictures stood out to you the most? Why?
            1. E.g. was it because it was a nice pictures? A useful picture? Something else?
        iv. What text captions stood out to you the most? What about them made them stand out?
        v. Can you compare the usefulness of and your interest in text only messages, picture only and combination messages?
        vi. Did you look at "other messages sent by this person"?
            1. What made you interested to look at those?

2. Did you feel like you were getting to know this person any better?

vii. Have you tried any of the ideas in the messages?
viii. Have you learned anything about resources that exist in the community for eating healthfully?
ix. Have you learned any ways of cooking cultural foods in a more healthful way (i.e. African American soul food)?
x. Have you learned ideas for preparing healthy foods more generally?
xi. What did you think about the "Community Response" part of the system that shows how many people were "inspired", etc.?
xii. Did you see any of the messages that you sent?
    1. Did you look for your own messages? Why/why not?
    2. How did you react to/feel about seeing your messages on the display?
    3. Did you see how many people had viewed your content?
        a. How did you react to seeing that?
        b. Were you surprised by how many times it had been viewed?
    4. Did you see how many times people had pressed each button (inspired, learn, hope)?
        a. How did you react to seeing this?
        b. Were you surprised by any of the reactions?
    5. Did seeing your content on the screen affect your desire to share content?

6. Did you ever press any of the "Community Response" buttons? Why/why not?
    a. What did you think about those buttons? Useful/not useful?
    b. What did you think about the fact that they were mostly positive? Do you think there should have been room for other kinds of reactions (e.g. to show that you disagree, etc.)?
    c. *Try to get at whether or not they noticed the fact that the buttons are community-focused vs. individual focused.*
7. How useful or not useful do you think Community Mosaic is for helping you to eat healthfully? Please describe.
8. Since using Community Mosaic, have your thoughts about how possible it is to eat healthfully in your community changed at all? (improved, gotten worse, stayed the same?)
9. Do you feel that you are helping to improve the health of your community at all by sending in your healthy eating ideas?
10. Is there anything you would change about how Community Mosaic works?
11. Is there anything that you particularly liked about Community Mosaic?
12. **Reminder: Send 1-2 msgs, May June July**
13. **Schedule next session**

E.4 Semi-Structured Interview Guide: Interview #2

Sending Messages

1. What did you think about **the mode of sending sms/mms**? Would you have rather shared your ideas through a different medium? What would have been better/worse about another medium?
2. Tell me about the **messages you sent since we last talked** (what they were of, how you decided what to send).
    a. Did sending messages make you **reflect upon your eating habits at all**?
    b. Did sending messages **make you think about the ease/difficulty of trying to eat healthfully**?
    c. Did you feel like you **had enough useful ideas to share**?
3. **Would you send content if not asked**/not in the study?
4. **When did you send messages? Right after meal**? Etc.?
5. Do you feel like you're **helping people in a way that's different from what you've been able to do in the past**?

Update messages

6. did it ever tell you X people were inspired? What did you think about that?

Viewing messages

7. Have you looked at any of the messages on the display in the YMCA?
    a. If NO, **what has stopped you** from doing so?
    b. **How many times did you visit** the display?
    c. Did you ever **look at the display with anyone** else?
    d. Did **seeing the messages on the display influence what you chose to send**? How so?
    e. Did you **see any messages that were useful** for you?
    f. What **pictures stood out** to you the most? Why?
        i. E.g. was it because it was a nice pictures? A useful picture?
    g. What **text captions stood out** to you the most? What about them made them stand out?
    h. Can you **compare the usefulness of and your interest in** text only messages, picture only and combination messages?
    i. Did you look at "**other messages sent by this person**"?
        i. What made you interested to look at those?
        ii. Did you feel like you were getting to know this person any better?
    j. Have you **tried any of the ideas** in the messages?
    k. Have you **learned anything new** about resources that exist in the community for eating healthfully?
    l. Have you **learned any ways of cooking cultural foods** in a more healthful way (i.e. African American soul food)?
    m. **Have you learned ideas for preparing healthy foods more generally**?
    n. What did you think about the "**Community Response**" part of the system that shows how many people were "inspired", etc.?
    o. Did you see any of the **messages that you sent**?
        i. **Did you look** for your own messages? Why/why not?
        ii. **How did you react to/feel** about seeing your messages on the display?
        iii. **Did you see how many people had viewed your content**?

        a. How did you react to seeing that?
        b. Were you surprised by how many times it had been viewed?
    2. **Did you see how many times people had pressed each button** (inspired, learn, hope)?
        a. How did you react to seeing this?
        b. Were you surprised by any of the reactions?
    3. **Did seeing your content on the screen affect your desire to share content**?
8. **Did you ever press any of the "Community Response**" buttons? Why/why not?
    a. **What did you think about those buttons? Useful/not useful**?
    b. **What did you think the point of the buttons was**?
    c. **What did you think about the fact that they were mostly positive**? Do you think there should have been room for other kinds of reactions (e.g. to show that you disagree, etc.)?
    d. *Try to get at whether or not they noticed the fact that the buttons are community-focused vs. individual focused.*
9. **How useful or not useful do you think Community Mosaic is** for helping you to eat healthfully? Please describe.
10. **Since using Community Mosaic, have your thoughts about how possible it is to eat healthfully in your community changed** at all? (improved, gotten worse, stayed the same?)
11. Do you feel that you are **helping to improve the health of your community** at all by sending in your healthy eating ideas?
12. Is there **anything you would change** about how Community Mosaic works?
13. Is there **anything that you particularly liked** about Community Mosaic?

E.5 Semi-Structured Focus Group Guide for Closing Session

1. How useful do you think Community Mosaic is for helping this community to eat healthfully?
2. What made it useful/not useful? (What were the strengths & weaknesses of the system?)
3. Does this system meet any of the nutrition-related needs of this community?
4. What would make the display more beneficial for the community?
5. Should CM be about competition or cooperation or both?

E.6 Community Mosaic User Guide

community mosaic User Guide

Sending Messages

Take pictures of foods, places, people, things - anything that shows how you are trying to eat healthfully! Send these pictures with an optional text note that describes how you are trying to eat well.

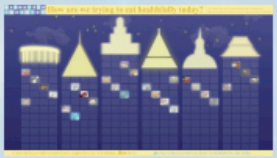
Send your picture (+ optional text caption) to [redacted].

If you cannot send picture messages, you can send a text message describing your healthy eating ideas instead.

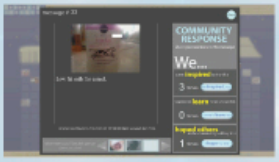
Viewing Messages: Main Window

Once your message has been received, you will get a text message letting you know that it has been posted to the Community Mosaic kiosk monitor. You can interact with this kiosk in the YMCA by the locker rooms on the first floor. All messages are shown anonymously.

Messages show up as lit windows in the buildings on the Community Mosaic kiosk monitor. You can press any window in the building to view the message in more detail.



Viewing Messages: Detail Window



The detail window shows a message's picture, textual note, when it was sent and how many people have viewed the message. At the bottom of the window, you can also see other messages sent by this person. Press a photo to see the details of that message. Press the right and left arrows to see more messages from this person.

On the right side of the detail window is the Community Response section. Here you can share your reactions to the message and see the reactions of others in your community. To share your reactions, press one of the blue buttons to show that you were inspired by the message, that you want to learn more or that you hope others in the community will try the healthy eating idea shown in the message.

Press the blue "close" button at the top right of the window to return to the Main Window.

Text Message Updates

After you've sent your first message to Community Mosaic, you will begin to receive a weekly text message update from the system. These updates will tell you how many messages have been shared this week and how many times people were inspired to try your healthy eating ideas. To stop these updates text "STOP UPDATES" to [redacted]

Help For help, text "HELP" to [redacted] You will get a response text message with basic information about Community Mosaic.

Have questions? Contact [redacted]

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